digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

OPTION NUMBER

QJ900-FZ
[A00]

SOFTWARE BILL OF MATERIAL

Page: 01

MAINTAINER: SOFTWARE DISTRIBUTION CENTER
(MAYNARD, MASSACHUSETTS 01754)

Date: 18-Mar-77

OPTION TITLE: BASIC/PTS LISTING KIT

SOFTWARE ASSEMBLY POINT: NB GA MR WM
CHECKLIST DISTRIBUTION : NB GA MR WM

Sel Chk	Qty	Program Code	Program Title
-	1	DEC-11-LPTBA-B-LA	LISTING OF BASIC/PTS

KIT CONTENTS:
1 SYS Listing

IDENTIFICATION

AB-2045B-SC

PRODUCT CODE	DEC-11-LPTBA-B-LA
PRODUCT NAME	LISTING OF BASIC/PTS
DATE CREATED	MAY 1974
MAINTAINER	DEVELOPMENT
AUTHOR	A. STANKARD

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```
BASICL  MACX11   V021   22-MAR-73   16:05   PAGE 1

                1
                2          000001                       $NOSTR=1
                3                                       .EOT
```

```
BASICL  MACX11   V021   22-MAR-73   16:05   PAGE 1-1

                4
```

```
                        ;
                        ; BASIC/PTS  PART1-BASICL
                        ;
                        ; DEC-11-LPTBA-A-L-1
                        ;
                        ; COPYRIGHT 1973
                        ;
                        ; DIGITAL EQUIPMENT CORPORATION
                        ; MAYNARD, MASSACHUSETTS 01754
```



```
                        .TITLE  BASICL  V001A EDIT #61 (REF) 03/01/73
                        ;                               SOURCE FILE #1
000000                  .ASECT
                        ;
                        ;
                        ;
                        ; BASIC CONSISTS OF THREE MODULES:
                        ;       1) BASICL - INTERPRETER WITH SYSTEM I/O
                        ;       2) FPMP-11 - MATH PACKAGE CONDITIONALIZED FOR USE IN BASIC
                        ;       3) BASICM - USER AREA AND ONCE-ONLY CODE
                        ;
                        ;
                        ;
                        ;
                        ;
                        ;
                        ; ORIGINAL PAPER TAPE VERSION   BY: LEN LEVKMAN
                        ;
                        ; MODIFICATION AND COMMENTS     BY: ROY FOLK
                        ;
                        ; COMPLETION AND FURTHER
                        ; COMMENTS                      BY: ANN STANKARD
                        ;
```

```
                        ;*****************************************************
                        ;*****************************************************
                        ;*************                             *************
                        ;*************  GLOBALS( ASSY, PARAMS,)    *************
                        ;*************  DESCRIPTION( LOW CORE)     *************
                        ;*************  GENERAL TABLES,            *************
                        ;*************  CONSTANTS, STORAGE         *************
                        ;*************                             *************
                        ;*****************************************************
                        ;*****************************************************



                        ;
                        ; GLOBALS
                        ;
                        ; --FPMP-11
                        ;
                                ,GLOBL  $POLSH
                                ,GLOBL  $IR
                                ,GLOBL  $MLR
                                ,GLOBL  $DVR
                                ,GLOBL  $AOR,$SBR
                                ,GLOBL  SIN,COS,SQRT,ALOG,ATAN,EXP
                                ,GLOBL  $ERVEC
                        ;
                        ; --BASIC2
                        ;
                                ,GLOBL  TPB, TKS
                                ,GLOBL  START
                                ,GLOBL  USRAREA
                                ,GLOBL  FILLCO
                                ,GLOBL  LIMIT, POL, ARRAYS, POSIZE
                                ,GLOBL  ERRPOL, ERRMIX, ERRSYN, ERRARG
                                ,GLOBL  TABLES, TBLSEN
                                ,GLOBL  EVAL, GETVAR, STOVAR, MSG
                                ,GLOBL  COLUMN, FAC1, FAC2, ,RPAR, ,LPAR
                                ,GLOBL  INT, MAKEST, OPRATO, SOPRAT
                                ,GLOBL  ,COMMA, T1, T2, T3, ,EOL
                                ,GLOBL  NUMOUT, NUMSGN, ARGB, STPRO
                                ,GLOBL  SAVCHAR,VAL,NORM
                                ,GLOBL  RND1, RND2
                                ,GLOBL  $STKSZ, ERRFPU
```



```
                        ;
                        ; ASSEMBLY PARAMS,
                        ;
                                ,IFNDF  $STKSZ  ;SIZE OF STACK
                        $STKSZ  =200            ;BYTES
                                ,ENDC
                        ;
                                ,IFNDF  $PRORG  ;PROG, ORIGIN AFTER VECTOR SPACE
                        $PRORG  =400
                                ,ENDC
                        ;
                                ,IFNDF  $PPBSZ  ;PP BUFF, SIZE
                        $PPBSZ  =30
                                ,ENDC
                        ;
                                ,IFNDF  $PRBSZ  ;PAPER-TAPE READER BUFF, SIZE
                        $PRBSZ  =30
                                ,ENDC
                        ;
                                ,IFNDF  $LPBSZ  ;LINE-PRINTER BUFF, SIZE
                        $LPBSZ  =40
                                ,ENDC
                        ;
                        ;  $NOPTP = NO PAPER TAPE; DEFINE TO ELIMINATE CODE FOR HIGH SPEED
                        ;   PAPER TAPE
                        ;
                        ;  $NOLPT = NO LINE PRINTER; DEFINE TO ELIMINATE LINE PRINTER CODE
                        ;
                        ;  $LONGER = LONG ERROR MESSAGES; DEFINE TO GET LONG,
                        ;       EXPLANATORY ERROR MESSAGES,
                        ;
                        ;  $NOSTR = NO STRINGS; DEFINE TO ELIMINATE STRING VARIABLE CODE
                        ;
                        ;  $NOPOW = NO POWER FAIL; DEFINE TO ASSEMBLE WITHOUT
                        ;       POWER FAIL/RESTART ROUTINE,
                        ;
                        ;
                        ;
```

```
;
; HOT POOP!!
;
; --USER AREA MAP
;
; HIGH ADDRESSES+----------------+
;               | GOSUB POINTERS | <--LIMIT(R5) NEEDED
;               | 26 FN POINTERS |
;               | READ POINTER   | <--PDL(R5) NEEDED
;               +----------------+
;               |  PUSH          |
;               |  DOWN          |    PDSIZE(R5) NEEDED =
;               |  LIST          |  (PDL(R5)-ARRAYS(R5))/2-STACK(INTERRUPT)
;               +----------------+
;               |                | <--ARRAYS(R5) NEEDED
;               |  ARRAYS        |
;               |                |
;               |          \!/   |
;               |           V    |
;               +----------------+
;               |   STRINGS      |
;               +----------------+
;               |           A    |
;               |          /!\   |
;               |           !    |
;               | SYMBOLS        |
;               +----------------+
;               |           A    |
;               |          /!\   |
;               |           !    |
;               | INTERP.        |
;               | CODE           | <--CODE(R5) NEEDED
;               +----------------+
;               |  USER          |
;               |  LINE          |
;               |  BUFFER        | <--LINE(R5) NEEDED
;               +----------------+
;               | USER I/O BUFF, |
;               | AND BUFF. HDR, |
;               | SPACE (TTY)    |
;               +----------------+
;               |  USER AREA     |
;               | STORAGE CELLS  |
; R5 POINTS-->  |                |
;               +----------------+
;
;
```



```
;
; --
;
; CODE AREA CONTAINS STRING OF CODE BYTES WHICH COMPRISE
;  THE COMPILED CODE TO BE INTERPETED.  THE SYNTAX SCAN OF THESE
;  CODE BYTES IS FACILITATED BY THE JUDICIOUS PLACEMENT
;  OF CERTAIN OF THESE CODE BYTES TO BE CALLED 'TOKENS',
;  IF THE HIGH BIT OF A TOKEN IS ON
;  IT IS A SYSTEM SYMBOL (S.SYM), (SEE TABLE, BELOW,)
;  HIGH BIT OFF SIGNALS TOKEN AS THE HIGH ORDER BYTE OF A WORD
;  (LOW ORDER BYTE FOLLOWS TOKEN) USED AS AN ADDRESS OFFSET INTO
;  THE USER SYMBOL TABLE (USPTR).
;
; --SYMBOL TABLE ENTRIES
;
; ARE MADE FOR LINE NUMBERS, SCALARS, NUMERIC ARRAYS, AND
;  STRINGS, AS SHOWN (IN ORDER):
;
;       LINENO  177779  177776  177777
;       ADDRESS VALUE   ADDRESS ADDRESS
;               VALUE   MAXSS1  MAXSS1
;               0       MAXSS2  MAXSS2
;               VARNAME VARNAME STRINGNAME
;
; --GENERAL REGISTER USAGE
;
; R1 IS BASIC EXECUTION PC
; R4 IS THE EXECUTION STACK DEPTH
; R5 IS THE POINTER TO THE USER AREA
```

```
                                        ;
                                        ; INTERUPT VECTORS AND LOWEST CODE
                                        ;
                    000000              .       .=0
000000  000167  001030                          JMP     START           ;RESTART AT LOC, #0
                    000004              .       .=4
000004  000006  000000                  .       .+2,0                   ;TIME OUT, BUSS ERROR
                    000010              .       .=10
000010  000012  000000                  .       .+2,0                   ;RESERVED INSTRUCTION
                    000014              .       .=14
000014  000016  000000                  .       .+2,0                   ;DEBUG, TRAP VEC,
                    000020              .       .=20
000020  007742  000000                  .       BOMB,0                  ;IOT TRAP VEC,

                    000024              .       .=24

                                                ;.IFNDF  $NOPOW
000024  007330  000000                  .       POWDWN,0                ;POWER FAIL/RESTART
                                                ;.ENDC

                                                ;.IFDF   $NOPOW
                                                .       .+2,0   ;HALT ON POWER FAIL
                                                ;.ENDC

                    000030              .       .=30
000030  000032  000000                  .       .+2,0                   ;EMT TRAP
                    000034              .       .=34
000034  000036  000000                  .       .+2,0                   ;'TRAP' TRAP
                                        ;
                                        ;  ++'SYSTEM' AREA
                                        ;
                    000040              .       .=40
000040    001     101           000000  VERNUM: .BYTE   001,'A          ;VERSION NUMBER
000042  000000  000000  000000                  0,0,0,0,0,0,0,0
000050  000000  000000  000000
000056  000000
                                        ;
                                        ; ++INTERUPT VECTORS
                                        ;
                    000060              .       .=60
000060  006470  000200                  .       KBINT;PR4               ;KEYBOARD
                    000064              .       .=64
000064  006642  000200                  .       TPINT;PR4               ;TELEPRINTER
                    000070              .       .=70
                                                ;.IFNDF  $NOPTP
000070  007104  000200                  .       PTRINT;PR4              ;HSP, PT, READER
                    000074              .       .=74
000074  007204  000200                  .       PPINT;PR4               ;HSP, PT, PUNCH
                                                ;.ENDC
                                                ;.IFDF   $NOPTP
                                                .       0,0,0,0
                                                ;.ENDC
                    000200              .       .=200
                                                ;.IFNDF  $NOLPI
000200  007256  000200                  .       LPINT;PR4
```



```
                                                ;.ENDC
                                                ;.IFDF   $NOLPI
                                                .       0,0
                                                ;.ENDC
                    000240              .       .=240
000240  000242  000000                  .       .+2,0                   ;PIRQ
                    000244              .       .=244
000244  0000006 000000                  .       ERRFPV,0                ;FLOATING POINT TRAP

                    000400              .       .=$PRORG                ;START OF CODE (MAY HAVE TO CHANGE,
                                                                        ;  DEPENDING UPON ATTACHED DEVS.)

```

```
                                ;
                                ; GENERAL ASSIGNMENTS, VARIABLES, GLOBALS, ETC;
                                ;

                                ; --REGISTER ASSIGNMENTS
                                ;
000000                          R0      =%0
000001                          R1      =%1
000002                          R2      =%2
000003                          R3      =%3
000004                          R4      =%4
000005                          R5      =%5
000006                          SP      =%6
000007                          PC      =%7
                                ;
                                ; --DEVICE REGISTER CONSTANTS
                                ;
177560                          TKS     =177560
177562                          TKB     =177562
177564                          TPS     =177564
177566                          TPB     =177566
177550                          PRS     =177550
177552                          PRB     =177552
177554                          PPS     =177554
177556                          PPB     =177556
177514                          LPS     =177514
177516                          LPB     =177516
                                ;
                                ; --GENERAL CONSTANTS
                                ;
000011                          TAB     =11
000012                          LF=     012
000014                          FF      =14
000015                          CR=     015
000040                          BL=     040
177776                          PS      =177776
000140                          PR3     =140            ;PRIORITY LEVEL 3
000200                          PR4     =200
000340                          PR7     =340
177775                          .SCALAR =177775         ;USER SYM, TABLE FLAG FOR SCALAR
177776                          .NVAR   =177776         ;FLAG FOR NUMERIC ARRAY VARIABLE
177777                          .SVAR   =177777         ;FLAG FOR STRING VAR.
```



```
                                ;
                                ; --USER AREA STORAGE CELL OFFSETS
                                ;
000000                          SYMBOLS =       0               ;CONTAINS ADDR OF THE FIRST SYMBOL
000002                          LIMIT   =       SYMBOLS+2       ;CONTAINS ADDR OF HIGHEST WD OF USER AREA
000004                          PDL     =       LIMIT+2         ;CONTAINS ADDR OF EMPTY STACK
000006                          PDSIZE  =       PDL+2           ;CONTAINS LOW LIMIT OF STACK
000010                          ARRAYS  =       PDSIZE+2        ;CONTAINS ADDR OF HIGHEST WORD OF ARRAYS
000012                          HIFREE  =       ARRAYS+2        ;CONTAINS ADDR OF HIGHEST FREE WORD
000014                          LOFREE  =       HIFREE+2        ;CONTAINS ADDR OF LOWEST FREE WORD
000016                          CODE    =       LOFREE+2        ;CONTAINS ADDR OF INTERPRETIVE CODE
000020                          LINE    =       CODE+2          ;CONTAINS ADDR OF USER LINE BUFFER
000022                          VARSAV  =       LINE+2          ;VAR SAVE FOR ASSIGNMENT
000024                          SS1SAVE =       VARSAV+2        ;SS1 SAVE FOR ASSIGNMENT
000026                          SS2SAVE =       SS1SAVE+2       ;SS2 SAVE FOR ASSIGNMENT
000030                          LINENO  =       SS2SAVE+2       ;CONTAINS THE LINE NUMBER
000032                          GSBCTR  =       LINENO+2        ;CONTAINS 33*DEPTH OF ACTIVE GOSUBS
000034                          COLUMN  =       GSBCTR+2        ;HAS ADDR OF COL CT FOR CURRENT DEV
000036                          CLMNTTY =       COLUMN+2        ;LAST TTY COLUMN TYPED
000040                          FAC1    =       CLMNTTY+2       ;HIGH ORDER FLOATING VALUE
000042                          FAC2    =       FAC1+2          ;LOW ORDER FLOATING VALUE
000044                          R0SAVE  =       FAC2+2          ;PLACE FOR R0 WHILE IN FPMP11
000046                          R1SAVE  =       R0SAVE+2        ;DITTO R1
000050                          R2SAVE  =       R1SAVE+2        ;DITTO R2
000052                          R3SAVE  =       R2SAVE+2        ;DITTO R3
000054                          R4SAVE  =       R3SAVE+2        ;DITTO R4
000056                          T1      =       R4SAVE+2        ;SHORT TERM TEMPORARY
000060                          T2      =       T1+2            ;DITTO
000062                          T3      =       T2+2            ;DITTO
000064                          RND1    =       T3+2            ;HISTORY OF RND
000066                          RND2    =       RND1+2          ;DITTO
000070                          RNDCT   =       RND2+2          ;RANDOMIZER
000072                          LOSTR   =       RNDCT+2         ;LOW LIMIT OF STRING STORAGE
000074                          HISTR   =       LOSTR+2         ;HIGH LIMIT OF STRING STORAGE
                                ; --THESE NEXT TWO MUST BE LO BYTE AND HI BYTE, RESPECTIVELY,
                                ;   OF SAME WORD
000076                          ODEV    =       HISTR+2         ;OUTPUT DEV CODE (TTY=0,PT=2,LP=4)
000077                          IDEV    =       ODEV+1          ;INPUT DEV CODE (TTY=0,PR=2)
000100                          TPHD    =       ODEV+2          ;HOLDS START OF TELEPRT BUFF HDR
000102                          KBHD    =       TPHD+2          ;HOLDS START OF KBD BUFF HDR
000104                          ECHOSP  =       KBHD+2          ;ADDR OF NEXT ECHO CHAR (IF NON-0)
000106                          CNCFLG  =       ECHOSP+2        ;'+C' FLAG, NON=0 IF PENDING
000107                          CNOFLG  =       CNCFLG+1        ;'+O' FLAG, DITTO
000110                          FILLCO  =       CNOFLG+1        ;FILL-COUNT
000111                          FILLNO  =       FILLCO+1        ;NO OF FILL CHARS
000112                          FILLCH  =       FILLNO+1        ;CHAR BEFORE FILL
000113                          SPARE   =       FILLCH+1        ; [SPARE BYTE]
                                ;
                                ; --I/O BUFFER HEADER OFFSETS
                                ;
000000                          BSTRT   =0      ;(R1)   START OF BUFF,
000002                          BEND    =2      ;BEND(R1)       END OF BUFFER
000004                          BGET1   =4      ;BGET1(R1)      FIRST GET POINTER
000006                          BGET2   =6      ;BGET2(R1)      SECOND GET PTR;
000010                          BPUT    =10     ;BPUT(R1)       PUT PTR.
```

```
                000012          BFSPEC  =12    ;BFSPEC(R1)     SPECIAL WORD = USE PARTIC. TO DEV.
                                ;
                                ; --SYSTEM VARIABLES
                                ;
000400  000000                  CLMNPP: .WORD   0       ;PAPER TAPE PUNCH COLUMN POSITION
000402  000000                  CLMNLP: .WORD   0       ;LINE PRINTER COLUMN POSITION
```



```
                                ;
                                ; -- SYSTEM TOKEN DEFINITIONS
                                ;
                                ;
000201                          .EOL=   201     ;BEGINNING OF SEQUENCE USED BY 'KEYWDS' AND 'TABLE1'
000202                          .END=   .EOL+1
000203                          .FOR=   .END+1
000204                          .GOSUB= .FOR+1
000205                          .GOTO=  .GOSUB+1
000206                          .IF=    .GOTO+1
000207                          .INPUT= .IF+1
000210                          .LET=   .INPUT+1
000211                          .NEXT=  .LET+1
000212                          .PRINT= .NEXT+1
000213                          .RETURN=.PRINT+1
000214                          .STOP=  .RETURN+1
000215                          .DIM=   .STOP+1
000216                          .RANDOM=.DIM+1
000217                          .RESTOR=.RANDOM+1
000220                          .REM=   .RESTOR+1
000221                          .DEF=   .REM+1
000222                          .READ=  .DEF+1
000223                          .DATA=  .READ+1
000224                          .CALL=  .DATA+1
000225                          .EOF=   .CALL+1 ;END OF SEQUENCE USED BY 'TABLE1'
000226                          .AMPERS=.EOF+1
000227                          .UPARRO=.AMPERS+1;BEGINNING OF SEQUENCE USED BY 'TABLE2' AND OPR PREC.
000230                          .STAR=  .UPARRO+1
000231                          .SLASH= .STAR+1
000232                          .PLUS=  .SLASH+1
000233                          .UNARY= .PLUS+1
000234                          .MINUS= .UNARY+1
000235                          .TERM=  .MINUS+1;END OF SEQUENCE USED BY 'TABLE2'
000236                          .SEMI=  .TERM+1
000237                          .RPAR=  .SEMI+1
000240                          .TO=    .RPAR+1
000241                          .STEP=  .TO+1
000242                          .THEN=  .STEP+1
000243                          .COMMA= .THEN+1
000244                          .LE=    .COMMA+1
000245                          .EL=    .LE+1
000246                          .GE=    .EL+1
000247                          .EG=    .GE+1
000250                          .NE=    .EG+1
000251                          .EN=    .NE+1
000252                          .LT=    .EN+1
000253                          .GT=    .LT+1
000254                          .EQ=    .GT+1   ;END OF SEQUENCE USED BY OPERATOR PRECEDENCE
000255                          .LPAR=  .EQ+1
000256                          .DQUOT= .LPAR+1
000257                          .SQUOT= .DQUOT+1
000260                          .COLON  =.SQUOT+1
000261                          .POUND= .COLON+1
000262                          .FN=    .POUND+1
000263                          .RNDL=  .FN+1   ;BEGINNING OF SEQUENCE USED BY 'TABLE5'
```

```
 424           000264                  ,RND=   ,RNDL+1
 425           000265                  ,SIN=   ,RND+1
 426           000266                  ,COS=   ,SIN+1
 427           000267                  ,SQR=   ,COS+1
 428           000270                  ,ATN=   ,SQR+1
 429           000271                  ,EXP=   ,ATN+1
 430           000272                  ,LOG=   ,EXP+1
 431           000273                  ,ABS=   ,LOG+1
 432           000274                  ,INT=   ,ABS+1
 433           000275                  ,SGN=   ,INT+1
 434           000276                  ,TAB=   ,SGN+1
 435
 436                                           ,IFNDF  $NOSTR
 437                                   ,LEN=   ,TAB+1
 438                                   ,ASC=   ,LEN+1
 439                                   ,CHR$=  ,ASC+1
 440                                   ,POS=   ,CHR$+1
 441                                   ,SEG=   ,POS+1
 442                                   ,VAL=   ,SEG+1
 443                                   ,STR=   ,VAL+1  ;END OF SEQUENCE USED BY ;TABLE5;
 444                                   ,LIST=  ,STR+1  ;BEGINNING OF SEQUENCE USED BY ;TABLE4;
 445                                           ,ENDC
 446
 447                                           ,IFDF   $NOSTR
 448           000277                  ,LIST=  ,TAB+1
 449                                           ,ENDC
 450
 451           000300                  ,RUN=   ,LIST+1
 452           000301                  ,SAVE=  ,RUN+1
 453           000302                  ,OLD=   ,SAVE+1
 454           000303                  ,SCR=   ,OLD+1
 455           000304                  ,CLEAR= ,SCR+1  ;END OF SEQUENCE USED BY ;TABLE4; AND ;KEYWDS;
 456           000374                  ,FLIT=  374
 457           000375                  ,ILIT1= 375
 458           000376                  ,ILIT2= 376
 459           000377                  ,TEXT   =377
 460
```



```
 461                                   ;
 462                                   ; *-KEYWORD TABLE
 463                                   ;
 464                                   ;       ENTRIES ARE ORDERED BY THEIR FREQUENCY OF
 465                                   ;       OCCURRENCE;  ALPHA KEYWORDS START AT ;KEYA;.
 466                                   ;
 467  000404     053                   KEYWDS: ,ASCII  /+/
 468  000405     232                           ,BYTE   ,PLUS
 469  000406     055                           ,ASCII  /-/
 470  000407     234                           ,BYTE   ,MINUS
 471  000410     052                           ,ASCII  /*/
 472  000411     230                           ,BYTE   ,STAR
 473  000412     057                           ,ASCII  //
 474  000413     231                           ,BYTE   ,SLASH
 475  000414     136                           ,ASCII  /^/
 476  000415     227                           ,BYTE   ,UPARRO
 477  000416     050                           ,ASCII  /(/
 478  000417     255                           ,BYTE   ,LPAR
 479  000420     051                           ,ASCII  /)/
 480  000421     237                           ,BYTE   ,RPAR
 481  000422     134                           ,ASCII  /\/
 482  000423     201                           ,BYTE   ,EOL
 483  000424     046                           ,ASCII  /&/
 484  000425     226                           ,BYTE   ,AMPERS
 485  000426     073                           ,ASCII  /;/
 486  000427     236                           ,BYTE   ,SEMI
 487  000430     054                           ,ASCII  /,/
 488  000431     243                           ,BYTE   ,COMMA
 489  000432  036474                           ,ASCII  /<=/
 490  000434     244                           ,BYTE   ,LE
 491  000435     075     074                   ,ASCII  /=</
 492  000437     244                           ,BYTE   ,LE
 493  000440  036476                           ,ASCII  />=/
 494  000442     246                           ,BYTE   ,GE
 495  000443     075     076                   ,ASCII  /=>/
 496  000445     246                           ,BYTE   ,GE
 497  000446  037074                           ,ASCII  /<>/
 498  000450     250                           ,BYTE   ,NE
 499  000451     076     074                   ,ASCII  /></
 500  000453     250                           ,BYTE   ,NE
 501  000454     074                           ,ASCII  /</
 502  000455     252                           ,BYTE   ,LT
 503  000456     076                           ,ASCII  />/
 504  000457     253                           ,BYTE   ,GT
 505  000460     075                           ,ASCII  /=/
 506  000461     254                           ,BYTE   ,EQ
 507  000462     042                           ,ASCII  /"/
 508  000463     256                           ,BYTE   ,DQUOT
 509  000464     047                           ,ASCII  /'/
 510  000465     257                           ,BYTE   ,SQUOT
 511  000466     072                           ,ASCII  /:/
 512  000467     260                           ,BYTE   ,COLON
 513  000470     043                           ,ASCII  /#/
 514  000471     261                           ,BYTE   ,POUND
 515  000472     133                           ,ASCII  /[/
```

```
                                        ;BYTE   ;LPAR
                                        ;ASCII  'J'
                                        ;BYTE   ;RPAR
000476 042514  020124          KEYA:    ;ASCII  'LET '          ;START OF ALPHA KEYWORDS

000502    210                           ;BYTE   ;LET
000503    111  020106                   ;ASCII  'IF '
000506    206                           ;BYTE   ;IF
000507    107  020117  047524           ;ASCII  'GO TO '
000514    040
000515    205                           ;BYTE   ;GOTO
000516 047506  020122                   ;ASCII  'FOR '
000522    203                           ;BYTE   ;FOR
000523    040  047524     040           ;ASCII  ' TO '
000527    240                           ;BYTE   ;TO
000530 042516  052130     040           ;ASCII  'NEXT '
000535    211                           ;BYTE   ;NEXT
000536 052040  042510  020116           ;ASCII  ' THEN '
000544    242                           ;BYTE   ;THEN
000545    040  052123  050105           ;ASCII  ' STEP '
000552    040
000553    241                           ;BYTE   ;STEP
000554 047507  052523  020102           ;ASCII  'GOSUB '
000562    204                           ;BYTE   ;GOSUB
000563    122  052105  051125           ;ASCII  'RETURN'
000570    116
000571    213                           ;BYTE   ;RETURN
000572 047111  052520  020124           ;ASCII  'INPUT '
000600    207                           ;BYTE   ;INPUT
000601    120  044522  052116           ;ASCII  'PRINT '
000606    040
000607    212                           ;BYTE   ;PRINT
000610 042522     115                  ;ASCII  'REM'
000613    220                           ;BYTE   ;REM
000614 042504  020106                   ;ASCII  'DEF '
000620    221                           ;BYTE   ;DEF
000621    122  040505  020104           ;ASCII  'READ '
000626    222                           ;BYTE   ;READ
000627    104  052101  020101           ;ASCII  'DATA '
000634    223                           ;BYTE   ;DATA
000635    103  046101  020114           ;ASCII  'CALL '
000642    224                           ;BYTE   ;CALL
000643    106     116                   ;ASCII  'FN'
000645    262                           ;BYTE   ;FN
000646 047122  024104                   ;ASCII  'RND(('
000652    263                           ;BYTE   ;RNDL
000653    122  042116                   ;ASCII  'RND'
000656    264                           ;BYTE   ;RND
000657    123  047111     050           ;ASCII  'SIN(('
000663    265                           ;BYTE   ;SIN
000664 047503  024123                   ;ASCII  'COS(('
000670    266                           ;BYTE   ;COS
000671    123  051121     050           ;ASCII  'SQR(('
000675    267                           ;BYTE   ;SQR
000676 052101  024116                   ;ASCII  'ATN(('
```



```
000702    270                           ;BYTE   ;ATN
000703    105  050130     050           ;ASCII  'EXP(('
000707    271                           ;BYTE   ;EXP
000710 047514  024107                   ;ASCII  'LOG(('
000714    272                           ;BYTE   ;LOG
000715    101  051502     050           ;ASCII  'ABS(('
000721    273                           ;BYTE   ;ABS
000722 047111  024124                   ;ASCII  'INT(('
000726    274                           ;BYTE   ;INT
000727    123  047107     050           ;ASCII  'SGN(('
000733    275                           ;BYTE   ;SGN
000734 040524  024102                   ;ASCII  'TAB(('
000740    276                           ;BYTE   ;TAB

                                        ;IFNDF  $NOSTR
                                        ;ASCII  'LEN(('
                                        ;BYTE   ;LEN
                                        ;ASCII  'ASC(('
                                        ;BYTE   ;ASC
                                        ;ASCII  'CHR$(('
                                        ;BYTE   ;CHR$
                                        ;ASCII  'POS(('
                                        ;BYTE   ;POS
                                        ;ASCII  'SEG$(('
                                        ;BYTE   ;SEG$
                                        ;ASCII  'VAL(('
                                        ;BYTE   ;VAL
                                        ;ASCII  'STR$(('
                                        ;BYTE   ;STR$
                                        ;ENDC

000741    104  046511     040           ;ASCII  'DIM '
000745    215                           ;BYTE   ;DIM
000746 040522  042116  046517           ;ASCII  'RANDOMIZE'
000754 055111     105
000757    216                           ;BYTE   ;RANDOM
000760 042522  052123  051117           ;ASCII  'RESTORE'
000766    105
000767    217                           ;BYTE   ;RESTORE
000770 052123  050117                   ;ASCII  'STOP'
000774    214                           ;BYTE   ;STOP
000775    105  042116                   ;ASCII  'END'
001000    202                           ;BYTE   ;END
001001    114  051511     124           ;ASCII  'LIST'
001005    277                           ;BYTE   ;LIST
001006 052522     116                   ;ASCII  'RUN'
001011    300                           ;BYTE   ;RUN
001012 040523  042526                   ;ASCII  'SAVE'
001016    301                           ;BYTE   ;SAVE
001017    117  042114                   ;ASCII  'OLD'
001022    302                           ;BYTE   ;OLD
001023    123  051103                   ;ASCII  'SCR'
001026    303                           ;BYTE   ;SCR
001027    103  042514                   ;ASCII  'CLE'
001032    304                           ;BYTE   ;CLEAR
```

```
                                                                                
                                                                                
001033    000                   .BYTE   0               ;END OF TABLE FLAG      
                                .EVEN                                           
                                .EOT                                            
                                                                                
```



```
                                ;                               SOURCE FILE #2
                                ;***************************************************
                                ;***************************************************
                                ;***********                             ***********
                                ;*********** MAIN FLOW ROUTINES          ***********
                                ;***********                             ***********
                                ;***************************************************
                                ;***************************************************
                                ;
                                ; START = PROGRAM STARTING POINT
                                ;
001034  016705  000000G START:  MOV     USRAREA,R5
001040  016506  000004          MOV     POL(R5),SP
001044  005065  000104          CLR     ECHOSP(R5)
001050  004767  007056          JSR     PC,BUFCLR       ;CLEAR OUT ALL I/O RING BUFFERS
001054  016506  000004 SCRATCH: MOV     POL(R5),SP
001060  004767  012700          JSR     PC,INITSCR
001064  004767  007334 CLEAR:  JSR     PC,CLRVARS
001070  000402                  BR      READY
                                
```

```
                                        ;+----------------------------------------------------------------
                                        ;
                                        ; READY - PRINT 'READY'
                                        ;
001072  004767  007034          READY0: JSR     PC,BUFCLR       ;CLEAR ALL I/O RING BUFFERS
001076  016506  000004          READY:  MOV     POL(R5),SP
001102  005065  000106                  CLR     CNCFLG(R5)      ;'C' AND 'O' FLAGS
001106  005065  000076                  CLR     ODEV(R5)
001112  012765  000036  000034          MOV     #CLMNTTY,COLUMN(R5)     ;SET TO COUNT TTY COLUMNS
001120  060565  000034                  ADD     R5,COLUMN(R5)   ; NOW
001124  004167  014344                  JSR     R1,MSG
001130     015     012                  .BYTE   CR,LF
001132  042522  042101     131          .ASCII  'READY'
001137     000                          .BYTE 0
                                        .EVEN
001140  016506  000004          READY2: MOV     POL(R5),SP
001144  004167  014324                  JSR     R1,MSG
001150     015     012     012          .BYTE   CR,LF,LF
001153     000                          .BYTE 0
                                        .EVEN
001154  005065  000076          IOINIT: CLR     ODEV(R5)        ;CLR ODEV AND IDEV BYTES IN USER AREA
```



```
                                        ;+----------------------------------------------------------------
                                        ;
                                        ; EDIT -
                                        ;
                                        ;  GET LINE, TRANSLATE INTO TOKENS, AND MOVE LINE INTO
                                        ;   USER CODE SPACE, WITH ALL ENTRIES MADE INTO USER
                                        ;   SYMBOL TABLE, ARRAY SPACE, AND STRING SPACE.
                                        ;
001160  004767  013160          EDIT:   JSR     PC,LINGET
001164  103026                          BCC     EDITL           ;NORMAL INPUT LINE
001166  127527  000016  000225          CMPB    @CODE(R5),#,EOF ;CHECK EMPTY PROGRAM
001174  001336                          BNE     READY0          ;NO, RETURN TO TTY INPUT
001176  000167  015642                  JMP     DEVERR          ;YES, DEVICE NOT READY
001202  004767  016146          EDITL1: JSR     PC,TRAN
001206  005201                          INC     R1
001210  010146                          MOV     R1,-(SP)
001212  016501  000020                  MOV     LINE(R5),R1
001216  160116                          SUB     R1,(SP)
001220  112100                          MOVB    (R1)+,R0
001222  100417                          BMI     EDIMMED
001224  000300                          SWAB    R0
001226  152100                          BISB    (R1)+,R0
001230  061500                          ADD     (R5),R0
001232  021027  177775                  CMP     (R0),#,SCALAR
001236  103011                          BHIS    EDIMMED
001240  016501  000016                  MOV     CODE(R5),R1
001244  021627  000003                  CMP     (SP),#3         ;IF THERE ARE ONLY 3 BYTES THEN THE LINE
001250  001013                          BNE     EDISRCH         ;CONATINS LINENO,CR AND MEANS DELETE.
001252  005016                          CLR     (SP)
001254  005060  000002                  CLR     2(R0)
001260  000407                          BR      EDISRCH
001262  105765  000077          EDIMMED:TSTB    IDEV(R5)
001266  001334                          BNE     EDIT            ;IGNORE IMM STMTS FROM NON-TTY
001270  000167  000454                  JMP     IMMED
001274  004767  015660          EDISKIP:JSR     PC,SKIPEOL
001300  010104          EDISRCH:MOV     R1,R4           ;R0 POINTS TO LINENO OF THE NEW LINE,
001302  121127  000225                  CMPB    (R1),#,EOF      ;@(SP) CONTAINS LENGTH OF THE NEW LINE,
001306  001452                          BEQ     EDIPUT
001310  111103                          MOVB    (R1),R3
001312  100770                          BMI     EDISKIP
001314  005201                          INC     R1
001316  000303                          SWAB    R3
001320  152103                          BISB    (R1)+,R3
001322  061503                          ADD     (R5),R3
001324  021327  177775                  CMP     (R3),#,SCALAR
001330  103361                          BHIS    EDISKIP
001332  021013                          CMP     (R0),(R3)
001334  101357                          BHI     EDISKIP
001336  001036                          BNE     EDIPUT
001340  004767  015614          EDIPASS:JSR     PC,SKIPEOL
001344  121127  000225                  CMPB    (R1),#,EOF
001350  001427                          BEQ     EDIOVER
001352  111103                          MOVB    (R1),R3
001354  100771                          BMI     EDIPASS
001356  005201                          INC     R1
```

```
  727 001360 000303                    SWAB    R3
  728 001362 152103                    BISB    (R1)+,R3
  729 001364 061503                    ADD     (R5),R3
  730 001366 021327 177775             CMP     (R3),#,SCALAR
  731 001372 103362                    BHIS    EDIPASS
  732 001374 162701 000002             SUB     #2,R1
  733 001400 016500 000004             MOV     POL(R5),R0      ;IF A LINE IS CHANGED WHICH IS
  734 001404 016502 000032             MOV     GSBCTR(R5),R2   ;REFERENCED BY THE READ POINTER,AN EN
  735 001410 021004            EDICHG: CMP     (R0),R4         ;POINTER OR A GOSUB POINTER THEN THAT
  736 001412 101403                    BLOS    .+10            ;POINTER MUST BE CLEARED
  737 001414 021001                    CMP     (R0),R1
  738 001416 101001                    BHI     .+4
  739 001420 005010                    CLR     (R0)
  740 001422 005720                    TST     (R0)+
  741 001424 005302                    DEC     R2
  742 001426 003370                    BGT     EDICHG
  743 001430 160401            EDIOVER:SUB     R4,R1
  744 001432 000401                    BR      .+4
  745 001434 005001            EDIPUT: CLR     R1
  746 001436 161601                    SUB     (SP),R1         ;R1 NOW = #CHARS TO CONTRACT,
  747 001440 016500 000004             MOV     POL(R5),R0      ;ALL REFERENCES BY THE READ POINTER
  748 001444 016502 000032             MOV     GSBCTR(R5),R2   ;WHICH REFER TO LINES WHICH ARE MOVED
  749 001450 021004            EDIMODF:CMP     (R0),R4         ;BECAUSE OF EDITING MUST BE RELOCATED
  750 001452 103401                    BLO     .+4
  751 001454 160110                    SUB     R1,(R0)
  752 001456 005720                    TST     (R0)+
  753 001460 005302                    DEC     R2
  754 001462 003372                    BGT     EDIMODF
  755 001464 005701                    TST     R1
  756 001466 100433                    BMI     EDIGROW         ;R4 NOW = ADDRESS AT WHICH TO INSERT,
  757 001470 001473                    BEQ     EDISAME
  758 001472 010402            EDICONT:MOV     R4,R2
  759 001474 061602                    ADD     (SP),R2
  760 001476 010203                    MOV     R2,R3
  761 001500 060103                    ADD     R1,R3
  762 001502 112322            EDIMOVE:MOVB    (R3)+,(R2)+     ;MOVE DOWN THE CODE,
  763 001504 020315                    CMP     R3,(R5)
  764 001506 103775                    BLO     EDIMOVE
  765 001510 105742                    TSTB    -(R2)
  766 001512 001401                    BEQ     .+4
  767 001514 005202                    INC     R2              ;R2 NOW POINTS TO BYTE AFTER THE ,EOF,
  768 001516 030227 000001             BIT     R2,#1
  769 001522 001401                    BEQ     .+4
  770 001524 105022                    CLRB    (R2)+           ;R2 NOW HAS THE NEW START OF THE SYMTAB,
  771 001526 010215                    MOV     R2,(R5)
  772 001530 012322                    MOV     (R3)+,(R2)+     ;MOVE DOWN THE SYMBOLS,
  773 001532 020365 000014             CMP     R3,LOFREE(R5)
  774 001536 103774                    BLO     .-6
  775 001540 010265 000014             MOV     R2,LOFREE(R5)
  776 001544 000401                    BR      .+4
  777 001546 005022                    CLR     (R2)+           ;CLEAR VACATED STRING STORAGE TO ZEROES,
  778 001550 020203                    CMP     R2,R3
  779 001552 103775                    BLO     .-4
  780 001554 000441                    BR      EDISAME
  781 001556 011500            EDIGROW:MOV     (R5),R0
```



```
  782 001560 105740                    TSTB    -(R0)
  783 001562 001401                    BEQ     .+4
  784 001564 005200                    INC     R0
  785 001566 160100                    SUB     R1,R0           ;R0 NOW POINTS PAST THE NEW HIGHEST BYTE
  786 001570 010003                    MOV     R0,R3           ;OF CODE,
  787 001572 005203                    INC     R3
  788 001574 042703 000001             BIC     #1,R3           ;R3 NOW HAS THE NEW START OF SYMTAB,
  789 001600 161503                    SUB     (R5),R3
  790 001602 066503 000014             ADD     LOFREE(R5),R3   ;R3 NOW HAS THE NEW VALUE OF LOFREE,
  791 001606 020365 000012             CMP     R3,HIFREE(R5)   ;CHECK TO SEE THAT THERE IS ENOUGH
  792 001612 101402                    BLOS    .+6
  793 001614 000167 016524     ERROV1: JMP     ERROV2
  794
  795                                  .IFNDF  $NOSTR
  796                                  MOV     R3,R2           ;CHECK TO SEE THAT THE SPACE THAT WILL
  797                                  TST     (R2)+           ;BE USED IS NOT OCCUPIED BY STRINGS
  798                                  CMP     R2,LOSTR(R5)
  799                                  BLO     EDIROOM
  800                                  JSR     PC,UPPACK       ;NO, MOVE THEM UP
  801                                  CMP     R2,LOSTR(R5)    ;TRY AGAIN
  802                                  BHIS    ERROV1
  803                                  .ENDC
  804
  805 001620 016502 000014     EDIROOM:MOV     LOFREE(R5),R2
  806 001624 010365 000014             MOV     R3,LOFREE(R5)
  807 001630 000401                    BR      .+4
  808 001632 014243            EDIMVUP:MOV     -(R2),-(R3)     ;MOVE UP THE SYMTAB,
  809 001634 020215                    CMP     R2,(R5)
  810 001636 101375                    BHI     EDIMVUP
  811 001640 010315                    MOV     R3,(R5)
  812 001642 105043                    CLRB    -(R3)           ;CLEAR THE POSSIBLY USED FILLER
  813 001644 010002                    MOV     R0,R2
  814 001646 060100                    ADD     R1,R0           ;R0 NOW POINTS PAST OLD HIGHEST BYTE
  815 001650 000401                    BR      .+4             ;OF SYMTAB,
  816 001652 114042                    MOVB    -(R0),-(R2)     ;MOVE UP THE CODE,
  817 001654 020004                    CMP     R0,R4
  818 001656 101375                    BHI     .-4
  819 001660 016500 000020     EDISAME:MOV     LINE(R5),R0     ;MOVE THE NEW LINE INTO THE CODE,
  820 001664 010401                    MOV     R4,R1
  821 001666 012602                    MOV     (SP)+,R2
  822 001670 000401                    BR      .+4
  823 001672 112024                    MOVB    (R0)+,(4)+
  824 001674 005302                    DEC     R2
  825 001676 002375                    BGE     .-4
  826 001700 121127 000225     EDIRLOC:CMPB    (R1),#,EOF
  827 001704 001417                    BEQ     EDIJMP
  828 001706 111102                    MOVB    (R1),R2
  829 001710 100412                    BMI     EDIRLOC
  830 001712 005201                    INC     R1
  831 001714 000302                    SWAB    R2
  832 001716 152102                    BISB    (R1)+,R2
  833 001720 061502                    ADD     (R5),R2
  834 001722 022227 177775             CMP     (R2)+,#,SCALAR
  835 001726 103003                    BHIS    EDIRLOC
  836 001730 010112                    MOV     R1,(R2)
```

```
  837 001732 162712 000002                SUB     #2,(R2)
  838 001736 004767 015216          EDIRLOC:JSR     PC,SKIPEOL
  839 001742 000756                         BR      EDIRLC8
  840 001744 000167 177210          EDIJMP: JMP     EDIT
  841
```



```
  842                                     ;+-----------------------------------------------------
  843                                     ;
  844                                     ; IMMED - IMMEDIATE MODE COMMANDS
  845                                     ;
  846                                     ;  DO IMMEDIATE ONLY COMMANDS (RUN, LIST, SCRATCH, CLEAR,
  847                                     ;   SAVE, AND OLD) AND SET UP OTHERS (UN-NUMBERED) FOR
  848                                     ;   EXECUTE.
  849                                     ;
  850 001750 012600                 IMMED:  MOV     (SP)+,R0                ;R0 NOW HAS # BYTES ON INPUT LINE.
  851 001752 005065 000076                  CLR     ODEV(R5)                ;TAKE ONLY THIS IMMED. COMM. FROM NON-TTY
  852 001756 016504 000006                  MOV     POSIZE(R5),R4
  853 001762 016501 000020                  MOV     LINE(R5),R1
  854 001766 005002                         CLR     R2
  855 001770 151102                         BISB    (R1),R2
  856 001772 162702 000277                  SUB     #,LIST,R2
  857 001776 006302                         ASL     R2
  858 002000 020227 000012                  CMP     R2,#TBL4END-TABLE4
  859 002004 101012                         BHI-    IMMSTMT
  860 002006 062702 000002                  ADD     #2,R2
  861 002012 060702                         ADD     PC,R2
  862 002014 061207                         ADD     (R2),PC
  863 002016 000102                 TABLE4: ,WORD   LIST-TABLE4
  864 002020 000206                         ,WORD   RUN-TABLE4
  865 002022 000124                         ,WORD   SAVE-TABLE4
  866 002024 000062                         ,WORD   OLD-TABLE4
  867 002026 177036                         ,WORD   SCRATCH-TABLE4  ;(IN 'START' CODE, ABOVE)
  868 002030 177046                 TBL4END:,WORD   CLEAR-TABLE4    ;(IN 'START' CODE, ABOVE)
  869 002032 260100                 IMMSTMT:ADD     R1,R0
  870 002034 020065 000016                  CMP     R0,CODE(R5)             ;SEE IF AN 'EOF' CAN BE FIT ON THE LINE.
  871 002040 103402                         BLO     .+6
  872 002042 000167 015770                  JMP     ERRTRN
  873 002046 112710 000225                  MOVB    #,EOF,(R0)
  874 002052 012765 177775 000030           MOV     #,SCALAR,LINENO(R5)
  875 002060 005065 000036                  CLR     CLNTTY(R5)              ;RE-SET ALL COLMN COUNTS
  876 002064 005067 176310                  CLR     CLMNPP
  877 002070 005067 176306                  CLR     CLMNLP
  878 002074 000167 000554                  JMP     EXECUTE                 ;START RUNNING.
  879
```

```
                                        ; 'OLD' COMMAND
002100 016506 000004            OLD:    MOV     POL(R5),SP      ;FLUSH OUT SYSTEM
002104 004767 011654                    JSR     PC,INITSCR      ;SCRATCH
002110 004767 006310                    JSR     PC,CLRVARS
002114 004767 015004                    JSR     PC,SCANPND      ;SCAN OFF '#'
002120 004767 006200                    JSR     PC,CHKISET      ;CHECK AND SET INPUT
002124 122127 000201                    CMPB    (R1)+,#,EOL     ;MUST END LINE RIGHT
002130 001402                           BEQ     OLD001
002132 000167 007512                    JMP     ERRSXD
002136 000167 177016            OLD001: JMP     EDIT            ;THIS DOES THE REST

                                        ; 'SAVE' COMMAND
002142 004767 014756            SAVE:   JSR     PC,SCANPND      ;SCAN OFF '#'
002146 004767 006160                    JSR     PC,CHKOSET      ;CHECK AND SET-UP OUTPUT
002152 120227 000002                    CMPB    R2,#2           ;LINE PRINTER?
002156 003404                           BLE     LISTSV          ;NO! LIST TAKES OVER
002160 004167 013336                    JSR     R1,MSGODEV      ;FOR LPT, START W/ 2 FORM-FEEDS
002164      014      014        000             .BYTE   FF,FF,0
002170                                          .EVEN
002170 004767 012606            LISTSV: JSR     PC,LSTPROG
002174 000167 176676                    JMP     READY

                                        ; 'LIST' COMMAND
002200 005201                   LIST:   INC     R1
002202 004767 011046                    JSR     PC,FLINE
002206 103770                           BCS     LISTSV
002210 011201                           MOV     (R2),R1         ;GET ADDR OF CODE LINE
002212 001766                           BEQ     LISTSV          ;IF UNDEF, NORMAL LIST
002214 004767 012566                    JSR     PC,LSTLOOP      ;LIST PARTIAL PROGR
002220 000167 176652                    JMP     READY
```



```
                                        ; 'RUN' COMMAND
002224 004767 006174            RUN:    JSR     PC,CLRVARS
002230 016501 000016                    MOV     CODE(R5),R1
002234 112102                   DIMLOOP:MOVB    (R1)+,R2
002236 100406                           BMI     DIMNONO
002240 000302                           SWAB    R2
002242 152102                           BISB    (R1)+,R2
002244 061502                           ADD     (R5),R2
002246 011265 000030                    MOV     (R2),LINENO(R5)
002252 112102                           MOVB    (R1)+,R2
002254 120227 000215            DIMNONO:CMPB    R2,#,DIM
002260 001415                           BEQ     DIMGOT
002262 120227 000221                    CMPB    R2,#,DEF
002266 001530                           BEQ     DEFGOT
002270 120227 000216                    CMPB    R2,#,RANDOM
002274 001504                           BEQ     RNDGOT
002276 120227 000225                    CMPB    R2,#,EOF
002302 001537                           BEQ     DIMDONE
002304 005301                           DEC     R1
002306 004767 014646            DEFDUN: JSR     PC,SKIPEOL
002312 000750                           BR      DIMLOOP
002314 112102                   DIMGOT: MOVB    (R1)+,R2
002316 100506                           BMI     ERRDIM
002320 000302                           SWAB    R2
002322 152102                           BISB    (R1)+,R2
002324 061502                           ADD     (R5),R2
002326 122127 000255                    CMPB    (R1)+,#,LPAR
002332 001100                           BNE     ERRDIM
002334 005003                           CLR     R3
002336 121127 000375                    CMPB    (R1),#,ILIT1
002342 001406                           BEQ     ALLOC1
002344 122127 000376                    CMPB    (R1)+,#,ILIT2
002350 001071                           BNE     ERRDIM
002352 111103                           MOVB    (R1),R3
002354 100467                           BMI     ERRDIM
002356 000303                           SWAB    R3
002360 005201                   ALLOC1: INC     R1
002362 152103                           BISB    (R1)+,R3
002364 012704 177777                    MOV     #-1,R4
002370 122127 000237                    CMPB    (R1)+,#,RPAR
002374 001423                           BEQ     DOALLOC
002376 124127 000243                    CMPB    -(R1),#,COMMA
002402 001054                           BNE     ERRDIM
002404 005201                           INC     R1
002406 005004                           CLR     R4
002410 121127 000375                    CMPB    (R1),#,ILIT1
002414 001406                           BEQ     ALLOC2
002416 122127 000376                    CMPB    (R1)+,#,ILIT2
002422 001044                           BNE     ERRDIM
002424 111104                           MOVB    (R1),R4
002426 100442                           BMI     ERRDIM
002430 000304                           SWAB    R4
002432 005201                   ALLOC2: INC     R1
002434 152104                           BISB    (R1)+,R4
002436 122127 000237                    CMPB    (R1)+,#,RPAR
```

```
  966 002442 001034                      BNE     ERRDIM
  967 002444 021227 177776       DOALLOC:CMP     (R2),#,NVAR
  968 002450 001431                      BEQ     ERRDIM
  969 002452 002403                      BLT     DIMSCLR
  970 002454 005762 000004               TST     4(R2)
  971 002460 100025                      BPL     ERRDIM
  972 002462 004767 005070       DIMSCLR:JSR     PC,ALLOC        ;VAR(R2),SS1(R3),SS2(4)
  973 002466 122127 000243               CMPB    (R1)+,#,COMMA
  974 002472 001710                      BEQ     DIMGOT
  975 002474 124127 000201               CMPB    -(R1),#,EOL
  976 002500 001015                      BNE     ERRDIM
  977 002502 005201                      INC     R1
  978 002504 000653                      BR      DIMLOOP
  979                            ;RANDOMIZE STATEMENT
  980 002506 016565 000070 000064 RNDGOT:MOV     RNDCT(R5),RND1(R5)
  981 002514 152765 000001 000064        BISB    #1,RND1(R5)
  982 002522 122127 000201               CMPB    (R1)+,#,EOL
  983 002526 001642                      BEQ     DIMLOOP
  984 002530 000167 007114               JMP     ERRSYN
  985 002534 000004              ERRDIM: IOT
  986                                    .IFNDF  $LONGER
  987 002536 042111     115              .ASCII  'IDM'
  988                                    .ENDC
  989                                    .IFDF   $LONGER
  990                                    .ASCII  'ILLEGAL DIM'
  991                                    .ENDC
  992 002541     000                     .BYTE 0
  993                                    .EVEN
  994 002542 000004              ERRDEF: IOT
  995                                    .IFNDF  $LONGER
  996 002544 042111     106              .ASCII  \IDF\
  997                                    .ENDC
  998                                    .IFDF   $LONGER
  999                                    .ASCII  'ILLEGAL DEF'
 1000                                    .ENDC
 1001 002547     000                     .BYTE 0
 1002                                    .EVEN
 1003 002550 122127 000262      DEFGOT: CMPB    (R1)+,#,FN
 1004 002554 001372                     BNE     ERRDEF
 1005 002556 112102                     MOVB    (R1)+,R2
 1006 002560 066502 000004             ADD     POL(R5),R2
 1007 002564 005712                     TST     (R2)
 1008 002566 001365                     BNE     ERRDEF
 1009 002570 122127 000255              CMPB    (R1)+,#,LPAR
 1010 002574 001362                     BNE     ERRDEF
 1011 002576 010112                     MOV     R1,(R2)
 1012 002600 000642                     BR      DEFDUN
 1013 002602 005065 000036      DIMDONE:CLR     CLMNTTY(R5)     ;RE-SET ALL COLUMN COUNTS
 1014 002606 005067 175566              CLR     CLMNPP
 1015 002612 005067 175564              CLR     CLMNLP
 1016 002616 016504 000000              MOV     POSIZE(R5),R4
 1017 002622 016501 000016              MOV     CODE(R5),R1
 1018 002626 121127 000225              CMPB    (R1),#,EOF
 1019 002632 001010                     BNE     EXECUTE         ;START RUNNING;
 1020 002634 004167 012626      ERRRUN: JSR     R1,MSGERR
```



```
 1021                                   .IFNDF  $LONGER
 1022 002640 050116     122             .ASCII  \NPR\
 1023                                   .ENDC
 1024                                   .IFDF   $LONGER
 1025                                   .ASCII  'NO PROGRAM'
 1026                                   .ENDC
 1027 002643     000                    .BYTE 0
 1028                                   .EVEN
 1029 002644 000167 176270              JMP     READY2
 1030
```

```
1031                                    ;*********************************************************
1032                                    ;
1033                                    ; EXECUTE - EXECUTE COMMAND LINE
1034                                    ;
1035  002650  004767  014304            IGNORE: JSR     PC,SKIPEOL
1036  002654  105765  000106            EXECUTE:TSTB    CNCFLG(R5)      ;^C' HIT?
1037  002660  001424                            BEQ     NOCNC
1038  002662  105065  000106                    CLRB    CNCFLG(R5)
1039  002666  000167  176204                    JMP     READY
1040  002672  112102            NOCNC:  MOVB    (R1)+,R2
1041  002674  002035                            BGE     NOTSYM          ;IT'S A POINTER,
1042  002676  042702  177600                    BIC     #^C200,R2
1043  002702  006302                            ASL     R2
1044  002704  020227  000052                    CMP     R2,#TBL1END-TABLE1+2
1045  002710  101127                            BHI     ERRSX1          ;NOT A STATEMENT WORD,
1046  002712  060702                            ADD     PC,R2
1047  002714  061207                            ADD     (R2),PC         ;BRANCH THRU TABLE1,
1048  002716  177736            TABLE1: .WORD   EXECUTE-TABLE1
1049  002720  000336                    .WORD   END-TABLE1
1050  002722  001216                    .WORD   FOR-TABLE1
1051  002724  001036                    .WORD   GOSUB-TABLE1
1052  002726  001036                    .WORD   GOTO-TABLE1
1053  002730  000400                    .WORD   IF-TABLE1
1054  002732  002732                    .WORD   INPUT-TABLE1
1055  002734  000272                    .WORD   LET-TABLE1
1056  002736  001726                    .WORD   NEXT-TABLE1
1057  002740  002240                    .WORD   PRINT-TABLE1
1058  002742  001142                    .WORD   RETURN-TABLE1
1059  002744  000360                    .WORD   STOP-TABLE1
1060  002746  177732                    .WORD   IGNORE-TABLE1
1061  002750  177732                    .WORD   IGNORE-TABLE1
1062  002752  001024                    .WORD   RESTORE-TABLE1
1063  002754  177732                    .WORD   IGNORE-TABLE1
1064  002756  177732                    .WORD   IGNORE-TABLE1
1065  002760  003330                    .WORD   READ-TABLE1
1066  002762  177732                    .WORD   IGNORE-TABLE1
1067  002764  000074                    .WORD   CALL-TABLE1
1068  002766  000336            TBL1END:.WORD   EOF-TABLE1
1069  002770  000302            NOTSYM: SWAB    R2
1070  002772  152102                    BISB    (R1)+,R2
1071  002774  061502                    ADD     (R5),R2
1072  002776  021227  177775            CMP     (R2),#,SCALAR
1073  003002  103107                    BHIS    ASSIGN          ;NOT A LINENO,
1074  003004  011265  000030            MOV     (R2),LINENO(R5) ;SAVE THE LINENO,
1075  003010  000721                    BR      EXECUTE
1076
1077
```



```
1078                                    ; 'CALL' STATEMENT
1079                                    ;       CALL "PROG" (,,.)
1080                                    CALL:
1081
1082                                            .IFNDF  $NOSTK
1083                                            JSR     PC,EVAL         ;EVALUATE FUNCTION NAME
1084                                            BCC     ERRSX1
1085                                            MOV     (SP)+,R0
1086                                            CMP     R0,#177777      ;CHECK NULL STRING
1087                                            BEQ     ERRFN1          ;YES, ERROR
1088                                            MOVB    (R0)+,R3        ;R3 IS STRING LENGTH
1089                                            MOVB    (R0)+,(R0)+     ;R0 IS ADDR OF CHARS
1090                                            .ENDC
1091
1092                                            .IFDF   $NOSTK
1093  003012  112102                            MOVB    (R1)+,R2        ;R2 IS QUOTE CHAR
1094  003014  120227  000257                    CMPB    R2,#'QUOT
1095  003020  001403                            BEQ     CALL1
1096  003022  120227  000256                    CMPB    R2,#"QUOT
1097  003026  001060                            BNE     ERRSX1
1098  003030  122127  000377            CALL1:  CMPB    (R1)+,#,TEXT
1099  003034  001055                            BNE     ERRSX1
1100  003036  010100                            MOV     R1,R0           ;R0 IS ADDR OF CHARS
1101  003040  005003                            CLR     R3
1102  003042  005203            CALLP:  INC     R3              ;COUNT CHARS IN R3
1103  003044  105721                            TSTB    (R1)+
1104  003046  001375                            BNE     CALLP
1105  003050  122102                            CMPB    (R1)+,R2        ;CHECK CLOSING QUOTE
1106  003052  001046                            BNE     ERRSX1
1107  003054  005303                            DEC     R3
1108  003056  001442                            BEQ     ERRFN1
1109                                            .ENDC
1110
1111                                    ;       INIT TABLE SEARCH
1112  003060  013702  000046                    MOV     @#46,R2
1113  003064  001437                            BEQ     ERRFN1          ;NO FUNCTIONS DEFINED
1114  003066  010246                            MOV     R2,-(SP)        ;SAVE ON STACK
1115                                    ;       CHECK END TABLE
1116  003070  105712            CALLCK: TSTB    (R2)
1117  003072  001434                            BEQ     ERRFN1
1118                                    ;       CHECK THAT (R3) CHARS MATCH
1119  003074  010046                            MOV     R0,-(SP)
1120  003076  010346                            MOV     R3,-(SP)
1121  003100  122022            CALLM1: CMPB    (R0)+,(R2)+
1122  003102  001034                            BNE     CALLNM
1123  003104  005303                            DEC     R3
1124  003106  001374                            BNE     CALLM1
1125                                    ;       CHECK THAT 4-(R3) CHARS ARE 0 IN TABLE
1126  003110  161603                            SUB     (SP),R3
1127  003112  062703  000004                    ADD     #4,R3
1128  003116  002422                            BLT     ERRFN1
1129  003120  001404                            BEQ     CALLX
1130  003122  105722            CALLM2: TSTB    (R2)+
1131  003124  001023                            BNE     CALLNM
1132  003126  005303                            DEC     R3
```

```
1133  003130  001374                        BNE     CALLM2
1134                                  ;       RETURN ANSWER
1135  003132  062706  000006          CALLX:  ADD     #6,SP           ;POP STACK
1136  003136  011202                        MOV     (R2),R2
1137  003140  001411                        BEQ     ERRFN1
1138  003142  010146                        MOV     R1,-(SP)
1139  003144  010446                        MOV     R4,-(SP)
1140  003146  010546                        MOV     R5,-(SP)
1141
1142  003150  004712                        JSR     PC,(R2)
1143
1144  003152  012605                        MOV     (SP)+,R5
1145  003154  012604                        MOV     (SP)+,R4
1146  003156  012601                        MOV     (SP)+,R1
1147  003160  000167  177464                JMP     IGNORE
1148  003164  000167  007026          ERRFN1: JMP     ERRUFN
1149  003170  000167  006454          ERRSX1: JMP     ERRSYN
1150                                  ;       ADVANCE TO NEXT TABLE ENTRY
1151  003174  012603                  CALLNM: MOV     (SP)+,R3
1152  003176  012600                        MOV     (SP)+,R0
1153  003200  062716  000006                ADD     #6,(SP)
1154  003204  011602                        MOV     (SP),R2
1155  003206  000730                        BR      CALLCK
1156
1157                                  ; 'LET' STATEMENT ROUTINE
1158  003210  112102                  LET:    MOVB    (R1)+,R2
1159  003212  100766                        BMI     ERRSX1          ;NOT A POINTER,
1160  003214  000302                        SWAB    R2
1161  003216  152102                        BISB    (R1)+,R2
1162  003220  061502                        ADD     (R5),R2
1163  003222  004767  010356          ASSIGN: JSR     PC,GETVAR
1164  003226  122127  000254                CMPB    (R1)+,#'=,EQ
1165  003232  001356                        BNE     ERRSX1          ;NOT EQSIGN,
1166  003234  004767  005356                JSR     PC,EVAL
1167
1168                                          .IFNDF  $NOSTR
1169                                          BCS     ASSSTR
1170                                          .ENDC
1171
1172  003240  122127  000201                CMPB    (R1)+,#',EOL
1173  003244  001351                        BNE     ERRSX1
1174  003246  004767  013772                JSR     PC,STOVAR
1175  003252  000600                        BR      EXECUTE
1176
1177                                          .IFNDF  $NOSTR
1178                                  ASSSTR: CMPB    (R1)+,#',EOL
1179                                          BNE     ERRSX1
1180                                          JSR     PC,STOSVAR
1181                                          BR      EXECUTE
1182                                          .ENDC
1183
1184                                  ; 'EOF' OR 'END' STATEMENT
1185                                  END:
1186  003254  020165  000016          EOF:    CMP     R1,CODE(R5)
1187  003260  103014                        BHIS    JMPRDY
```



```
1188  003262  004167  012206                JSR     R1,MSG
1189  003266     015     012                .BYTE   CR,LF
1190  003270     000                        .BYTE   0
1191          003272                      .EVEN
1192  003272  000167  175662                JMP     EDIT
1193                                  ; 'STOP' STATEMENT
1194  003276  004167  012172          STOP:   JSR     R1,MSG
1195  003302     015     012                .BYTE   CR,LF
1196  003304  052123  050117                .ASCII  'STOP!
1197  003310     000                        .BYTE   0
1198          003312                      .EVEN
1199  003312  000167  175560          JMPRDY: JMP     READY
1200
```

```
 1311  003712  001060                        BNE     ERRSX0
 1312  003714  120027  000246                CMPB    R0,#,GE
 1313  003720  001415                        BEQ     GOTO
 1314  003722  120027  000253                CMPB    R0,#,GT
 1315  003726  001412                        BEQ     GOTO
 1316  003730  120027  000250                CMPB    R0,#,NE
 1317  003734  001407                        BEQ     GOTO
 1318  003736  000167  176706                JMP     IGNORE
 1319  003742  012775  177777  000004  RESTORE:MOV   #-1,@POL(R5)
 1320  003750  000167  176700                JMP     EXECUTE
 1321
```



```
 1322                                  ; 'GOSUB' AND 'GOTO' STATEMENTS
 1323                                  GOSUB:
 1324  003754  004767  007274          GOTO:   JSR     PC,FLINE
 1325  003760  103435                        BCS     ERRSX0
 1326  003762  122127  000201                CMPB    (R1)+,#,EOL
 1327  003766  001032                        BNE     ERRSX0
 1328  003770  005712                        TST     (R2)
 1329  003772  001425                        BEQ     ERRGO
 1330  003774  126127  177774  000204        CMPB    -4(R1),#,GOSUB
 1331  004002  001013                        BNE     GONOSAV
 1332  004004  016503  000032                MOV     GSBCTR(R5),R3
 1333  004010  006303                        ASL     R3
 1334  004012  066503  000004                ADD     POL(R5),R3
 1335  004016  020365  000002                CMP     R3,LIMIT(R5)
 1336  004022  101006                        BHI     ERRDEEP
 1337  004024  010113                        MOV     R1,(R3)
 1338  004026  005265  000032                INC     GSBCTR(R5)
 1339  004032  011201          GONOSAV:MOV   (R2),R1
 1340  004034  000167  176614                JMP     EXECUTE
 1341  004040  000004          ERRDEEP:IOT
 1342                                        ,IFNDF  $LONGER
 1343  004042  047107     104                ,ASCII  \GND\
 1344                                        ,ENDC
 1345                                        ,IFDF   $LONGER
 1346                                        ,ASCII  'GOSUBS NESTED TOO DEEPLY'
 1347                                        ,ENDC
 1348  004045     000                        ,BYTE 0
 1349                                        ,EVEN
 1350  004046  000004          ERRGO:  IOT
 1351                                        ,IFNDF  $LONGER
 1352  004050  046125     116                ,ASCII  \ULN\
 1353                                        ,ENDC
 1354                                        ,IFDF   $LONGER
 1355                                        ,ASCII  'UNDEFINED LINE NUMBER'
 1356                                        ,ENDC
 1357  004053     000                        ,BYTE 0
 1358                                        ,EVEN
 1359  004054  000167  005570          ERRSX6: JMP     ERRSX5
 1360
```

```
                                        ; 'IF' STATEMENT ROUTINE
003316 004767 005274            IF:     JSR     PC,EVAL
003322 103113                           BCC     IFNUMER
003324 121127 000244                    CMPB    (R1),#,LE
003330 103717                           BLO     ERRSX1
003332 121127 000254                    CMPB    (R1),#,EQ
003336 101314                           BHI     ERRSX1
003340 020604                           CMP     SP,R4
003342 103551                           BLO     ERRPDL
003344 112146                           MOVB    (R1)+,-(SP)
003346 004767 005244                    JSR     PC,EVAL

                                        .IFNDF  $NOSTK
                                        BCC     ERRMX4
                                        .ENDC

003352 012603                           MOV     (SP)+,R3
003354 012600                           MOV     (SP)+,R0
003356 012602                           MOV     (SP)+,R2
003360 010046                           MOV     R0,-(SP)
003362 005046                           CLR     -(SP)
003364 020227 177777                    CMP     R2,#-1
003370 001401                           BEQ     .+4
003372 151216                           BISB    (R2),(SP)
003374 005000                           CLR     R0
003376 020327 177777                    CMP     R3,#-1
003402 001401                           BEQ     .+4
003404 151300                           BISB    (R3),R0
003406 062702 000003                    ADD     #3,R2
003412 062703 000003                    ADD     #3,R3
003416 000402                           BR      .+6
003420 122322                   IFLOOP: CMPB    (R3)+,(R2)+
003422 001047                           BNE     IFCOMP
003424 005300                           DEC     R0
003426 002410                           BLT     IFLEND
003430 005316                           DEC     (SP)
003432 002372                           BGE     IFLOOP
003434 122327 000040                    CMPB    (R3)+,#BL
003440 001040                           BNE     IFCOMP
003442 005300                           DEC     R0
003444 002373                           BGE     .-10
003446 000407                           BR      IFSEQ
003450 005716                   IFLEND: TST     (SP)
003452 003405                           BLE     IFSEQ
003454 122722 000040                    CMPB    #BL,(R2)+
003460 001030                           BNE     IFCOMP
003462 005316                           DEC     (SP)
003464 003373                           BGT     .-10
003466 005726                   IFSEQ:  TST     (SP)+
003470 012600                           MOV     (SP)+,R0
003472 112102                   IFLEQR: MOVB    (R1)+,R2
003474 120227 000242                    CMPB    R2,#,THEN
003500 001403                           BEQ     .+10
003502 120227 000205                    CMPB    R2,#,GOTO
003506 001013                           BNE     ERRSX7
```



```
003510 120027 000244                    CMPB    R0,#,LE
003514 001517                           BEQ     GOTO
003516 120027 000246                    CMPB    R0,#,GE
003522 001514                           BEQ     GOTO
003524 120027 000254                    CMPB    R0,#,EQ
003530 001511                           BEQ     GOTO
003532 000167 177112                    JMP     IGNORE
003536 000167 006106            ERRSX7: JMP     ERRSX
003542 002453                   IFCOMP: BLT     IFSGT
003544 005726                           TST     (SP)+
003546 012600                           MOV     (SP)+,R0
003550 000424                           BR      IFLLTR
003552 121127 000244            IFNUMER:CMPB    (R1),#,LE
003556 103767                           BLO     ERRSX7
003560 121127 000254                    CMPB    (R1),#,EQ
003564 101364                           BHI     ERRSX7
003566 020604                           CMP     SP,R4
003570 103436                           BLO     ERRPDL
003572 016546 000042                    MOV     FAC2(R5),-(SP)
003576 016546 000040                    MOV     FAC1(R5),-(SP)
003602 112146                           MOVB    (R1)+,-(SP)
003604 004767 005006                    JSR     PC,EVAL

                                        .IFNDF  $NOSTK
                                        BCS     ERRMX4
                                        .ENDC

003610 012600                           MOV     (SP)+,R0
003612 004767 013474                    JSR     PC,SUBSTK
003616 001725                           BEQ     IFLEQR
003620 002426                           BLT     IFLGTR
003622 112102                   IFLLTR: MOVB    (R1)+,R2
003624 120227 000242                    CMPB    R2,#,THEN
003630 001403                           BEQ     .+10
003632 120227 000205                    CMPB    R2,#,GOTO
003636 001126                           BNE     ERRSX6
003640 120027 000244                    CMPB    R0,#,LE
003644 001443                           BEQ     GOTO
003646 120027 000252                    CMPB    R0,#,LT
003652 001440                           BEQ     GOTO
003654 120027 000250                    CMPB    R0,#,NE
003660 001435                           BEQ     GOTO
003662 000167 176762                    JMP     IGNORE
003666 000167 005226            ERRPDJ: JMP     ERRPDL

                                        .IFNDF  $NOSTK
                                ERRMX4: JMP     ERRMIX
                                        .ENDC

003672 005726                   IFSGT:  TST     (SP)+
003674 012600                           MOV     (SP)+,R0
003676 112102                   IFLGTR: MOVB    (R1)+,R2
003700 120227 000242                    CMPB    R2,#,THEN
003704 001403                           BEQ     .+10
003706 120227 000205                    CMPB    R2,#,GOTO
```

```
                                        ; /RETURN/ STATEMENT
004060  122127  000201          RETURN: CMPB    (R1)+,#,EOL
004064  001373                          BNE     ERRSX0
004066  016503  000032                  MOV     GSBCTR(R5),R3
004072  020327  000033                  CMP     R3,#33
004076  001413                          BEQ     ERRRET
004100  005303                          DEC     R3
004102  010365  000032                  MOV     R3,GSBCTR(R5)
004106  006303                          ASL     R3
004110  066503  000004                  ADD     POL(R5),R3
004114  005713                          TST     (R3)
004116  001403                          BEQ     ERRRET
004120  011301                          MOV     (R3),R1
004122  000167  176526                  JMP     EXECUTE

                                        ,IFNDF  $NOSTM
                                ERRMX5: JMP     ERRMIX
                                        ,ENDC

004126  000004                  ERRRET: IOT
                                        ,IFNDF  $LONGER
004130  041122     107                  ,ASCII  \NBG\
                                        ,ENDC
                                        ,IFDF   $LONGER
                                        ,ASCII  /RETURN BEFORE GOSUB/
                                        ,ENDC
004133     000                          ,BYTE 0
                                        ,EVEN

                                        ; /FOR/ STATEMENT
004134  010146                  FOR:    MOV     R1,-(SP)
004136  005316                          DEC     (SP)            ;(LOC OF THE 'FOR')
004140  112102                          MOVB    (R1)+,R2
004142  100744                          BMI     ERRSX0
004144  000302                          SWAB    R2
004146  152102                          BISB    (R1)+,R2
004150  061502                          ADD     (R5),R2
004152  021227  177777                  CMP     (R2),#,SVAR
004156  001736                          BEQ     ERRSX0
004160  122127  000254                  CMPB    (R1)+,#,EQ
004164  001333                          BNE     ERRSX0
004166  010265  000022                  MOV     R2,VARSAV(R5)   ;(VAR OF THE FOR)
004172  004767  004420                  JSR     PC,EVAL

                                        ,IFNDF  $NOSTM
                                        BCS     ERRMX5
                                        ,ENDC

004176  012765  177777  000024          MOV     #-1,SS1SAV(R5)  ;FORCE TO SCALAR,
004204  004767  013034                  JSR     PC,STOVAR
004210  122127  000240                  CMPB    (R1)+,#,TO
004214  001317                          BNE     ERRSX0
004216  004767  004374                  JSR     PC,EVAL
```



```
                                        BCS     ERRMX5
                                        ,ENDC

004222  016565  000040  000024          MOV     FAC1(R5),SS1SAV(R5)
004230  016565  000042  000026          MOV     FAC2(R5),SS2SAV(R5);(LIMIT OF THE FOR)
004236  005065  000040                  CLR     FAC1(R5)
004242  012765  000001  000042          MOV     #1,FAC2(R5)     ;ASSUMED STEP IS 1.0
004250  121127  000201                  CMPB    (R1),#,EOL
004254  001410                          BEQ     FORONE
004256  122127  000241                  CMPB    (R1)+,#,STEP
004262  001274                          BNE     ERRSX0
004264  004767  004326                  JSR     PC,EVAL         ;(FAC HAS THE STEP)

                                        ,IFNDF  $NOSTM
                                        BCS     ERRMX5
                                        ,ENDC

004270  121127  000201                  CMPB    (R1),#,EOL
004274  001267                          BNE     ERRSX0
004276  005201                  FORONE: INC     R1
004300  016503  000030                  MOV     LINENO(R5),R3
004304  000402                          BR      FORLOOK
004306  004767  012646          FORSKIP:JSR     PC,SKIPEOL
004312  111102                  FORLOOK:MOVB    (R1),R2
004314  100410                          BMI     FORNOL
004316  005201                          INC     R1
004320  000302                          SWAB    R2
004322  152102                          BISB    (R1)+,R2
004324  061502                          ADD     (R5),R2
004326  021227  177775                  CMP     (R2),#,SCALAR
004332  103001                          BHIS    FORNOL
004334  011203                          MOV     (R2),R3         ;(THE LINENO WHILE LOOKING)
004336  121127  000225          FORNOL: CMPB    (R1),#,EOF
004342  001420                          BEQ     ERR4WO
004344  121127  000211                  CMPB    (R1),#,NEXT     ;THE CODE IS NOW BEING SEARCHED
004350  001420                          BEQ     FORNEXT         ;FOREWARD FROM THE 'FOR' FOR A NEXT WITH
004352  121127  000203                  CMPB    (R1),#,FOR      ;THE SAME VAR, IF 'EOF' OR ANOTHER 'FOR'
004356  001353                          BNE     FORSKIP         ;WITH THE SAME VAR IS FOUND FIRST;ERROR.
004360  005201                          INC     R1
004362  111102                          MOVB    (R1),R2
004364  100750                          BMI     FORSKIP
004366  005201                          INC     R1
004370  000302                          SWAB    R2
004372  152102                          BISB    (R1)+,R2
004374  061502                          ADD     (R5),R2
004376  020265  000022                  CMP     R2,VARSAV(R5)
004402  001341                          BNE     FORSKIP
004404  000004                  ERR4WO: IOT
                                        ,IFNDF  $LONGER
004406  053506     116                  ,ASCII  'FWN'
                                        ,ENDC
                                        ,IFDF   $LONGER
                                        ,ASCII  'FOR WITHOUT NEXT'
                                        ,ENDC
004411     000                          ,BYTE 0
```

```
                                        ;EVEN
004412  062701  000013          FORNEXT:ADD     #13,R1
004416  111102                          MOVB    (R1),R2
004420  100732                          BMI     FORSKIP
004422  005201                          INC     R1
004424  000302                          SWAB    R2
004426  152102                          BISB    (R1)+,R2
004430  061502                          ADD     (R5),R2
004432  020265  000022                  CMP     R2,VARSAV(R5)
004436  001323                          BNE     FORSKIP
004440  121127  000201                  CMPB    (R1),#,EOL
004444  001050                          BNE     ERSX10
004446  162701  000014                  SUB     #14,R1
004452  116621  000001                  MOVB    1(SP),(R1)+     ;PUT ADDR OF THE 'FOR' AFTER THE 'NEXT',
004456  111621                          MOVB    (SP),(R1)+      ;(THATS WHAT THE 2+4+4 BYTES ARE FOR)
004460  116521  000025                  MOVB    SS1SAV+1(R5),(R1)+;PUT THE LIMIT AFTER THAT,
004464  116521  000024                  MOVB    SS1SAV(R5),(R1)+
004470  116521  000027                  MOVB    SS2SAV+1(R5),(R1)+
004474  116521  000026                  MOVB    SS2SAV(R5),(R1)+
004500  116521  000041                  MOVB    FAC1+1(R5),(R1)+        ;PUT THE STEP AFTER THAT,
004504  116521  000040                  MOVB    FAC1(R5),(R1)+
004510  116521  000043                  MOVB    FAC2+1(R5),(R1)+
004514  116521  000042                  MOVB    FAC2(R5),(R1)+
004520  010316                          MOV     R3,(SP)         ;PUT THE SEARCH LINENO ON THE STACK,
004522  016546  000040                  MOV     FAC1(R5),-(SP)  ;PUT SGN(STEP) ON THE STACK,
004526  001002                          BNE     .+6
004530  016516  000042                  MOV     FAC2(R5),(SP)
004534  016546  000026                  MOV     SS2SAV(R5),-(SP)        ;PUT THE LIMIT ON THE STACK,
004540  016546  000024                  MOV     SS1SAV(R5),-(SP)
004544  004767  004046                  JSR     PC,EVAL         ;GET THE CURRENT VALUE OF THE INDEX,
004550  004767  012536                  JSR     PC,SUBSTK       ;SUBTRACT THE LIMIT,
004554  001421                          BEQ     FORGOGO
004556  100405                          BMI     FORLTLM
004560  005726                  FORGTLMI:TST    (SP)+
004562  100417                          BMI     FORGO
004564  000404                          BR      FOREERO
004566  000167  005056          ERSX10: JMP     ERRSX9
004572  005726                  FORLTLMI:TST    (SP)+
004574  100012                          BPL     FORGO
004576  012665  000030          FOREERO:MOV     (SP)+,LINENO(R5)
004602  105061  177764                  CLRB    -14(R1)
004606  105061  177765                  CLRB    -13(R1)
004612  005201                          INC     R1
004614  000167  176034                  JMP     EXECUTE
004620  005726                  FORGOGO:TST     (SP)+
004622  005726                  FORGO:  TST     (SP)+
004624  116146  177765                  MOVB    -13(R1),-(SP)
004630  116166  177764  000001          MOVB    -14(R1),1(SP)
004636  012601                          MOV     (SP)+,R1
004640  000167  176004                  JMP     IGNORE
                                        ;EOT
```



```
                                ;                               SOURCE FILE #3
                                ; 'NEXT' STATEMENT
004644  005002                  NEXT:   CLR     R2
004646  152102                          BISB    (R1)+,R2
004650  000302                          SWAB    R2
004652  152102                          BISB    (R1)+,R2
004654  020265  000014                  CMP     R2,LOFREE(R5)   ;JUST TO PREVENT AN NXM TRAP,
004660  103131                          BHIS    ERRNEXT
004662  122227  000203                  CMPB    (R2)+,#,FOR
004666  001126                          BNE     ERRNEXT
004670  062701  000010                  ADD     #10,R1
004674  112103                          MOVB    (R1)+,R3
004676  100525                          BMI     ERRSX2
004700  000303                          SWAB    R3
004702  151103                          BISB    (R1),R3
004704  061503                          ADD     (R5),R3
004706  005301                          DEC     R1
004710  122122                          CMPB    (R1)+,(R2)+
004712  001114                          BNE     ERRNEXT
004714  121122                          CMPB    (R1),(R2)+
004716  001112                          BNE     ERRNEXT
004720  121227  000254                  CMPB    (R2),#,EQ
004724  001107                          BNE     ERRNEXT
004726  010365  000022                  MOV     R3,VARSAV(R5)   ;SAVE VARIABLE ADDRESS,
004732  021327  177777                  CMP     (R3),#,SVAR
004736  001505                          BEQ     ERRSX2
004740  022327  177775                  CMP     (R3)+,#,SCALAR
004744  001401                          BEQ     .+4
004746  011303                          MOV     (R3),R3
004750  012365  000040                  MOV     (R3)+,FAC1(R5)  ;PUT THE FOR VAR VALUE INTO FAC,
004754  011365  000042                  MOV     (R3),FAC2(R5)
004760  005301                          DEC     R1
004762  114146                          MOVB    -(R1),-(SP)     ;PUT STEP ON THE STACK,
004764  114166  000001                  MOVB    -(R1),1(SP)
004770  114146                          MOVB    -(R1),-(SP)
004772  114166  000001                  MOVB    -(R1),1(SP)
004776  011665  000026                  MOV     (SP),SS2SAV(R5) ;SAVE SGN(STEP),
005002  001003                          BNE     .+10
005004  016665  000002  000026          MOV     2(SP),SS2SAV(R5)
005012  004767  002352                  JSR     PC,ADDSTK
005016  016546  000042                  MOV     FAC2(R5),-(SP)
005022  016546  000040                  MOV     FAC1(R5),-(SP)
005026  114146                          MOVB    -(R1),-(SP)
005030  114166  000001                  MOVB    -(R1),1(SP)
005034  114146                          MOVB    -(R1),-(SP)
005036  114166  000001                  MOVB    -(R1),1(SP)
005042  004767  012244                  JSR     PC,SUBSTK
005046  001417                          BEQ     NEXGO
005050  100404                          BMI     NEXLTLM
005052  005765  000026          NEXGTLMI:TST    SS2SAV(R5)
005056  100413                          BMI     NEXGO
005060  000403                          BR      NEXEND
005062  005765  000026          NEXLTLMI:TST    SS2SAV(R5)
005066  100007                          BPL     NEXGO
005070  105041                  NEXEND: CLRB    -(R1)
```

```
 1578  005072  105041                          CLRB    -(R1)
 1579  005074  062701  000015                  ADD     #15,R1
 1580  005100  022626                          CMP     (SP)+,(SP)+     ;THROW AWAY INCREMENTED INDEX,
 1581  005102  000167  175946                  JMP     EXECUTE
 1582  005106  114146                  NEXGO:  MOVB    -(R1),-(SP)
 1583  005110  114166  000001                  MOVB    -(R1),1(SP)
 1584  005114  012601                          MOV     (SP)+,R1
 1585  005116  012665  000040                  MOV     (SP)+,FAC1(R5)  ;STORE THE INCREMENTED INDEX,
 1586  005122  012665  000042                  MOV     (SP)+,FAC2(R5)
 1587  005126  012765  177777  000024          MOV     #-1,SS1SAV(R5)
 1588  005134  004767  012104                  JSR     PC,STOVAR
 1589  005140  000167  175504                  JMP     IGNORE
 1590  005144  000004                  ERRNEXT:IOT
 1591                                          ,IFNDF  $LONGER
 1592  005146  041116    100                   ,ASCII  \NBF\
 1593                                          ,ENDC
 1594                                          ,IFDF   $LONGER
 1595                                          ,ASCII  'NEXT BEFORE FOR'
 1596                                          ,ENDC
 1597  005151    000                           ,BYTE 0
 1598                                          ,EVEN
 1599  005152  000167  004472          ERRSX2: JMP     ERRSX3
 1600
```



```
 1601                                  ; 'PRINT' STATEMENT
 1602  005156  121127  000201          PRINT:  CMPB    (R1)+,#,POUND   ;IS IT 'PRINT #N[ ;,,]'
 1603  005162  001016                          BNE     PRNT01
 1604  005164  005201                          INC     R1
 1605  005166  004767  003140                  JSR     PC,CHKOSET      ;CHECK CHANNEL AND SET-UP I/O
 1606  005172  005702                          TST     R2              ;DEVICE CODE
 1607  005174  001403                          BEQ     COLONCH
 1608  005176  016265  005320  000034          MOV     TABL5(R2),COLUMN(R5)    ;NON-TTY COLUMN COUNT
 1609  005204  121127  000201          COLONCH:CMPB    (R1)+,#,EOL     ;DON'T NEED COLON IF NOTHING
 1610  005210  001403                          BEQ     PRNT01          ;  FOLLOWS NUMBER
 1611  005212  122127  000260                  CMPB    (R1)+,#,COLON
 1612  005216  001355                          BNE     ERRSX2
 1613  005220  121127  000243          PRNT01: CMPB    (R1)+,#,COMMA
 1614  005224  001440                          BEQ     PRICM
 1615  005226  121127  000236                  CMPB    (R1)+,#,SEMI
 1616  005232  001440                          BEQ     PRIBOTH
 1617  005234  121127  000201                  CMPB    (R1)+,#,EOL
 1618  005240  001435                          BEQ     PRIBOTH
 1619
 1620                                          ,IFDF   $NOSTR
 1621  005242  121127  000257                  CMPB    (R1)+,#,SQUOT   ;CHECK PRINT STRING
 1622  005246  001513                          BEQ     PRISTR
 1623  005250  121127  000256                  CMPB    (R1)+,#,DQUOT
 1624  005254  001510                          BEQ     PRISTR
 1625  005256  121127  000276                  CMPB    (R1)+,#,TAB     ;OR TAB FUNCTION
 1626  005262  001532                          BEQ     PRITB
 1627                                          ,ENDC
 1628
 1629  005264  004767  003326                  JSR     PC,EVAL
 1630
 1631                                          ,IFNDF  $NOSTR
 1632                                          BCS     PRISTR
 1633                                          ,ENDC
 1634
 1635  005270  027527  000034  000074          CMP     #COLUMN(R5),#74
 1636  005276  101402                          BLOS    .+6
 1637  005300  004767  000326                  JSR     PC,PRINCR
 1638  005304  004767  010450                  JSR     PC,NUMSGN
 1639  005310  016676                          ,WORD   PUTCHAR
 1640  005312  004167  010204                  JSR     R1,MSGODEV
 1641  005316    040                           ,ASCII  ' '
 1642  005317    000                           ,BYTE 0
 1643                                          ,EVEN
 1644  005320  000405                          BR      PRIBOTH
 1645
 1646          005320                  TABL5   *,.+2
 1647  005322  000400                          .       CLMNPP
 1648  005324  000402                          .       CLMNLP
 1649
 1650
 1651
 1652                                          ,IFNDF  $NOSTR
 1653                                  PRISTR: MOV     (SP)+,R2
 1654                                          INC     R2
 1655                                          BEQ     PRIBOTH
```

```
 1656                                           CLR     R3
 1657                                           BISB    -(R2),R3
 1658                                           ADD     #3,R2
 1659                                   PRILOOP:CMP     @COLUMN(R5),#110
 1660                                           BLO     .+6
 1661                                           JSR     PC,PRINCR
 1662                                           MOVB    (R2)+,R0
 1663                                           JSR     PC,PUTCHAR
 1664                                           DEC     R3
 1665                                           BGT     PRILOOP
 1666                                           BR      PRIBOTH
 1667                                           .ENDC
 1668
 1669  005326  004167  010170           PRICM:  JSR     R1,MSGODEV
 1670  005332     040     000                  .BYTE   BL,0
 1671  005334  121127  000201           PRIBOTH:CMPB    (R1),#,EOL
 1672  005340  001003                           BNE     PRIMORE
 1673  005342  004767  000264                   JSR     PC,PRINCR
 1674  005346  000441                           BR      PRIJMP
 1675  005350  122127  000243           PRIMORE:CMPB    (R1)+,#,COMMA
 1676  005354  001027                           BNE     PRISEMI
 1677  005356  317500  000034           PRICOMM:MOV     @COLUMN(R5),R0
 1678  005362  001430                           BEQ     PRITEST
 1679  005364  020027  000070                   CMP     R0,#70
 1680  005370  001425                           BEQ     PRITEST
 1681  005372  103403                           BLO     .+10
 1682  005374  004767  000232                   JSR     PC,PRINCR
 1683  005400  000421                           BR      PRITEST
 1684  005402  020027  000052                   CMP     R0,#52
 1685  005406  001416                           BEQ     PRITEST
 1686  005410  020027  000034                   CMP     R0,#34
 1687  005414  001413                           BEQ     PRITEST
 1688  005416  020027  000016                   CMP     R0,#16
 1689  005422  001410                           BEQ     PRITEST
 1690  005424  004167  010072                   JSR     R1,MSGODEV
 1691  005430     040                           .ASCII  ' '
 1692  005431     000                           .BYTE 0
 1693                                           .EVEN
 1694  005432  000751                           BR      PRICOMM
 1695  005434  124127  000236           PRISEMI:CMPB    -(R1),#,SEMI
 1696  005440  001267                           BNE     PRNT01
 1697  005442  005201                           INC     R1
 1698  005444  121127  000201           PRITEST:CMPB    (R1),#,EOL
 1699  005450  001263                           BNE     PRNT01
 1700  005452  005201                   PRIJMP: INC     R1
 1701  005454  012765  000036  000034           MOV     #CLMNITY,COLUMN(R5)     ;RE-SET TO TTY COLUMN COUNT
 1702  005462  060565  000034                   ADD     R5,COLUMN(R5)
 1703  005466  105065  000076                   CLRB    ODEV(R5)
 1704  005472  000167  175156                   JMP     EXECUTE
 1705
 1706                                           .IFDF   $NOSTR
 1707  005476  112103                   PRISTR: MOVB    (R1)+,R3        ;SAVE OPEN QUOTE CHAR
 1708  005500  122127  000377                   CMPB    (R1)+,#,TEXT    ;TEST FOR TEXT BYTE
 1709  005504  001222                   PRISJ:  BNE     ERRSX2
 1710  005506  112102                   PRIST1: MOVB    (R1)+,R2        ;GET NEXT CHAR
```



```
 1711  005510  001776                           BEQ     PRIST1
 1712  005512  120203                           CMPB    R2,R3           ;CHECK CLOSE QUOTE
 1713  005514  001707                           BEQ     PRIBOTH
 1714  005516  120227  000201                   CMPB    R2,#,EOL        ;CHECK END LINE
 1715  005522  001613                           BEQ     ERRSX2
 1716  005524  027527  000034  000110           CMP     @COLUMN(R5),#110
 1717  005532  103402                           BLO     .+6
 1718  005534  004767  000072                   JSR     PC,PRINCR
 1719  005540  010200                           MOV     R2,R0
 1720  005542  004767  011130                   JSR     PC,PUTCHAR
 1721  005546  000757                           BR      PRIST1
 1722
 1723  005550  105721                   PRITB:  TSTB    (R1)+
 1724  005552  004767  003040                   JSR     PC,EVAL
 1725  005556  004767  006222                   JSR     PC,INT
 1726  005562  122127  000237                   CMPB    (R1)+,#,RPAR
 1727  005566  001346                           BNE     PRISJ
 1728  005570  116502  000042                   MOVB    FAC2(R5),R2     ;GET FN VALUE
 1729  005574  167502  000034                   SUB     @COLUMN(R5),R2  ;COMPUTE # SPACES
 1730  005600  020227  000110           PRITB0: CMP     R2,#72.
 1731  005604  103403                           BLO     PRITB1
 1732  005606  162702  000110                   SUB     #72.,R2
 1733  005612  000772                           BR      PRITB0
 1734  005614  005302                   PRITB1: DEC     R2
 1735  005616  100646                           BMI     PRIBOTH
 1736  005620  012708  000040                   MOV     #BL,R0
 1737  005624  004767  011046                   JSR     PC,PUTCHAR
 1738  005630  000771                           BR      PRITB1
 1739                                           .ENDC
 1740                                   )
 1741  005632  004167  007664           PRINCR: JSR     R1,MSGODEV
 1742  005636     015     012                  .BYTE   CR,LF
 1743  005640     000                          .BYTE 0
 1744          005642                           .EVEN
 1745  005642  005075  000034                   CLR     @COLUMN(R5)
 1746  005646  000207                           RTS     PC
 1747
 1748
```

```
 1859  006234  000167  003410          ERRSX8: JMP     ERRSX9
 1860
 1861                                          .IFNDF  $NOSTR
 1862                                  INPSTR: MOV     LINE(R5),R3
 1863                                          MOV     R3,R2
 1864                                          CMPB    (R3)+,#CR
 1865                                          BNE     .+4
 1866                                          MOV     R2,-(SP)
 1867                                          SUB     #3,(SP)
 1868                                          MOV     R3,-(SP)
 1869                                          SUB     R2,(SP)
 1870                                          DEC     (SP)
 1871                                          BEQ     INPNULL
 1872                                          MOV     SP,R2
 1873                                          ADD     #2,R2
 1874                                          JSR     PC,MAKESTR
 1875                                  INPNNUL:JSR     PC,STOSVAR
 1876                                          TST     (SP)+
 1877                                          CMPB    (R1)+,#,COMMA
 1878                                          BNE     INPEND
 1879                                          TST     (SP)+
 1880                                          JMP     INPY01
 1881                                  INPNULL:MOV     #-1,(SP)
 1882                                          BR      INPNNUL
 1883                                          .ENDC
 1884
 1885  006240  000201                  INPEOL: .WORD   .EOL
 1886  006242  000167  011570          ERRTRN: JMP     ERRTRN
 1887
```



```
 1888                                  ; READ STATEMENT
 1889  006246  112102                  READ:   MOVB    (R1)+,R2
 1890  006250  100771                          BMI     ERRSX8
 1891  006252  000302                          SWAB    R2
 1892  006254  152102                          BISB    (R1)+,R2
 1893  006256  061502                          ADD     (R5),R2
 1894  006260  004767  005320                  JSR     PC,GETVAR
 1895  006264  017503  000004                  MOV     @PDL(R5),R3
 1896  006270  001444                          BEQ     ERRDATA
 1897  006272  020327  177777                  CMP     R3,#-1
 1898  006276  001451                          BEQ     READSRCH
 1899  006300  121327  000201                  CMPB    (R3),#.EOL
 1900  006304  001450                          BEQ     READFIND
 1901  006306  122327  000243                  CMPB    (R3)+,#,COMMA
 1902  006312  001036                          BNE     READBAD
 1903  006314  111302                  READGOT:MOVB    (R3),R2
 1904
 1905                                          .IFNDF  $NOSTR
 1906                                          CMPB    R2,#DQUOTE
 1907                                          BEQ     READQT
 1908                                          CMPB    R2,#SQUOTE
 1909                                          BEQ     READQT
 1910                                          .ENDC
 1911
 1912  006316  004767  006142                  JSR     PC,LITEVAL
 1913  006322  000432                          BR      READBAD
 1914  006324  010346                          MOV     R3,-(SP)
 1915  006326  004767  010712                  JSR     PC,STOVAR
 1916  006332  012603                  READDUN:MOV     (SP)+,R3
 1917  006334  121327  000201                  CMPB    (R3),#.EOL
 1918  006340  001403                          BEQ     .+10
 1919  006342  121327  000243                  CMPB    (R3),#,COMMA
 1920  006346  001020                          BNE     READBAD
 1921  006350  010375  000004                  MOV     R3,@PDL(R5)
 1922  006354  122127  000243                  CMPB    (R1)+,#,COMMA
 1923  006360  001732                          BEQ     READ
 1924  006362  126127  177777  000201          CMPB    -1(R1),#.EOL
 1925  006370  001321                          BNE     ERRSX8
 1926  006372  000167  174256                  JMP     EXECUTE
 1927  006376  005075  000004          READOUT:CLR     @PDL(R5)
 1928  006402  000004                  ERRDATA:IOT
 1929                                          .IFNDF  $LONGER
 1930  006404  047517      104                 .ASCII  \OOD\
 1931                                          .ENDC
 1932                                          .IFDF   $LONGER
 1933                                          .ASCII  'OUT OF DATA'
 1934                                          .ENDC
 1935  006407      000                         .BYTE 0
 1936                                          .EVEN
 1937  006410  005075  000004          READBAD:CLR     @PDL(R5)
 1938  006414  000004                          IOT
 1939                                          .IFNDF  $LONGER
 1940  006416  042102      122                 .ASCII  \BDR\
 1941                                          .ENDC
 1942                                          .IFDF   $LONGER
```

```
                                        ; 'INPUT' STATEMENT
                        INPUT:  CMP     R1,CODE(R5)
                                BHI     INPYES
                                JSR     R1,MSGERR
                                .IFNDF  $LONGER
                                .ASCII  \ILN\
                                .ENDC
                                .IFDF   $LONGER
                                .ASCII  'ILLEGAL NOW'
                                .ENDC
                                .BYTE 0
                                .EVEN
                                JMP     READY2
                        INPYES: CLRB    T3(R5)
                                CLRB    IDEV(R5)        ;RESET INPUT TO TTY
                                CMPB    (R1),#,POUND    ;IS IT 'INPUT #N1 ...'?
                                BNE     INPY01
                                INCB    T3(R5)
                                INC     R1
                                JSR     PC,CHKISET      ;CHECK CHANNEL AND SET-UP INPUT
                                CMPB    (R1)+,#,COLON
                                BNE     ERRSX8
                        INPY01: MOV     PC,-(SP)
                        INPPC:  ADD     #INPEOL-INPPC,(SP)
                        INPLOOP:MOVB    (R1)+,R2
                                BMI     ERRSX8
                                SWAB    R2
                                BISB    (R1)+,R2
                                ADD     (R5),R2
                                JSR     PC,GETVAR
                        INPRTRY:MOV     (SP),R3
                                CMPB    (R3),#,EOL
                                BNE     INPOK
                        INPNEW: TSTB    T3(R5)
                                BNE     NOQM
                                JSR     R1,MSG
                                .ASCII  '?'
                                .BYTE 0
                                .EVEN
                        NOQM:   MOV     R1,-(SP)
                                JSR     PC,LINGET
                                BCC     NOQM1
                                JMP     ERRDATA
                        NOQM1:  MOV     (SP)+,R1
                                MOV     VARSAV(R5),R2

                                .IFNDF  $NOSTR
                                CMP     (R2),#,SVAR
                                BEQ     INPSTR
                                .ENDC

                                MOV     R1,-(SP)
                                MOV     R4,-(SP)
                                MOV     LINE(R5),R4
                                CMPB    (R1)+,#CR
```



```
                                BNE     .+4
                                MOV     R1,R4
                                INC     R4
                                CMP     R4,CODE(R5)
                                BHI     ERRTR8
                                MOVB    -(R1),-(4)
                                CMP     R1,LINE(R5)
                                BHI     .+6
                                MOVB    #',,(R1)
                                JSR     PC,TRAN
                                MOV     (SP)+,R4
                                MOV     (SP)+,R1
                                MOV     LINE(R5),(SP)
                                BR      INPRTRY
                        INPOK:  MOV     VARSAV(R5),R2

                                .IFNDF  $NOSTR
                                CMP     (R2),#,SVAR
                                BEQ     INPNEW
                                .ENDC

                                INC     R3
                                CLR     FAC1(R5)
                                CLR     FAC2(R5)
                                CMPB    (R3),#,COMMA
                                BEQ     INPSTO
                                JSR     PC,LITEVAL
                                BR      INPNGUD
                        INPSTO: MOV     R3,(SP)
                                JSR     PC,STOVAR
                                MOV     (SP),R3
                                CMPB    (R3),#,COMMA
                                BEQ     INPGOOD
                                CMPB    (R3),#,EOL
                                BNE     INPNGUD
                        INPGOOD:CMPB    (R1)+,#,COMMA
                                BEQ     INPLOOP
                        INPEND: CMPB    -1(R1),#,EOL
                                BNE     ERRSX8
                                TST     (SP)+
                                TSTB    IDEV(R5)        ;IF TTY INPUT, CLR COLUMN COUNT
                                BNE     GOEXEC
                                CLR     CLMNTTY(R5)     ;  FOR SAME
                        GOEXEC: JMP     EXECUTE
                        INPNGUD:JSR     R1,MSGERR
                                .IFNDF  $LONGER
                                .ASCII  \BRT\
                                .ENDC
                                .IFDF   $LONGER
                                .ASCII  'BAD DATA-RETYPE FROM ERROR,'
                                .ENDC
                                .BYTE   CR,LF
                                .BYTE 0
                                .EVEN
                                BR      INPNEW
```

```
1943                                            ,ASCII  'BAD DATA READ'
1944                                            ,ENDC
1945  006421     000                            ,BYTE 0
1946                                            ,EVEN
1947  006422  016503  000016          READSRCH:MOV     CODE(R5),R3
1948  006426  105713                  READFIND:TSTB    (R3)
1949  006430  100402                           BMI     ,+6
1950  006432  062703  000002                   ADD     #2,R3
1951  006436  122327  000223                   CMPB    (R3)+,#,DATA
1952  006442  001724                           BEQ     READGOT
1953  006444  124327  000225                   CMPB    -(R3),#,EOF
1954  006450  001752                           BEQ     READOUT
1955  006452  010146                           MOV     R1,-(SP)
1956  006454  010301                           MOV     R3,R1
1957  006456  004767  010476                   JSR     PC,SKIPEOL
1958  006462  010103                           MOV     R1,R3
1959  006464  012601                           MOV     (SP)+,R1
1960  006466  000757                           BR      READFIND
1961
1962                                            ,IFNDF  $NOSTR
1963                                  READQT: INC     R3
1964                                          CMPB    (R3)+,#,TEXT
1965                                          BNE     READBAD
1966                                          MOV     R3,R0
1967                                          TSTB    (R3)+
1968                                          BNE     ,+2
1969                                          CMPB    (R3)+,R2
1970                                          BNE     READBAD
1971                                          MOV     R3,-(SP)
1972                                          MOV     R0,-(SP)
1973                                          SUB     #3,(SP)
1974                                          MOV     SP,R2
1975                                          MOV     R3,-(SP)
1976                                          SUB     R0,(SP)
1977                                          SUB     #2,(SP)
1978                                          BEQ     READNULL
1979                                          JSR     PC,MAKESTR
1980                                          MOV     (SP)+,R3
1981                                          MOV     R3,(SP)
1982                                          MOV     SP,R0
1983                                          ADD     #3,R3
1984                                          MOVB    R0,-(R3)
1985                                          SWAB    R0
1986                                          MOVB    R0,-(R3)
1987                                          BR      READSTR
1988                                  READNULL:DEC    (SP)
1989                                          MOV     (SP)+,(SP)
1990                                  READSTR:JSR     PC,STUSVAR
1991                                          BR      READDUN
1992                                          ,ENDC
1993
1994
```



```
1995                                    ;*****************************************************
1996                                    ;*****************************************************
1997                                    ;*************                           *************
1998                                    ;*************   INTERUPT HANDLERS       *************
1999                                    ;*************                           *************
2000                                    ;*****************************************************
2001                                    ;*****************************************************
2002
2003
2004
2005                                    ;
2006                                    ; KBINT = KEYBOARD INTERUPT SERVICE
2007                                    ;
2008                                    ;  PASS ANY CHAR, TO BUFF, EXCEPT 000 (IGNORE)
2009                                    ;    AND 003 ('C') SET FLAG FOR LATER ACTION,)
2010                                    ;    IF BUFF, FULL, IGNORE CHAR BUT ECHO BELL,
2011                                    ;
2012  006470  004567  010356          KBINT:  JSR     R5,SAVRGI       ;CAUSE RTI ON REG, RESTORE
2013  006474  016705  0000000G               MOV     USRAREA,R5
2014  006500  016501  000102                 MOV     KBWD(R5),R1     ;KB BUFF, WDR,
2015  006504  012704  177564                 MOV     #TPS,R4
2016  006510  113720  177562                 MOVB    @#TKB,R0        ;GET THAT CHAR,
2017  006514  042700  177600                 BIC     #177600,R0
2018  006520  001442                         BEQ     KBIDUN          ;IGNORE 000
2019  006522  120027  000003                 CMPB    R0,#003         ;'C'?
2020  006526  001005                         BNE     KBCO
2021  006530  105265  000106                 INCB    CNCFLG(R5)      ;MARK 'C' HIT
2022  006534  004767  001372                 JSR     PC,BUFCLR       ;CLEAR ALL BUFFERS
2023  006540  000410                         BR      DOPUT
2024  006542  120027  000017          KBCO:   CMPB    R0,#17          ;CHECK 'O'
2025  006546  001005                         BNE     DOPUT
2026  006550  105165  000107                 COMB    CNOFLG(R5)
2027  006554  001402                         BEQ     DOPUT           ;IF PRINT RESTORED,BYPASS
2028  006556  004767  001424                 JSR     PC,BUFTP        ;CLEAR TELEPRINTER BUFFER
2029  006562  004767  010016          DOPUT:  JSR     PC,PUTBYT
2030  006566  103017                         BCC     KBIDUN          ;GOT IN
2031  006570  105761  000012                 TSTB    BFSPEC(R1)
2032  006574  001003                         BNE     S,0101
2033  006576  110061  000012                 MOVB    R0,BFSPEC(R1)
2034  006602  000207                         RTS     PC
2035  006604  105714                 S,0101: TSTB    (R4)            ;NO ROOM! DO BELL
2036  006606  100376                         BPL     S,0101
2037  006610  042714  000100                 BIC     #100,(R4)       ;TEMP, CLR, INTER,
2038  006614  112737  000007  177566         MOVB    #007,@#TPB      ;INSERT BELL
2039  006622  105714                 S,0102: TSTB    (R4)            ;WAIT UNTIL DONE
2040  006624  100376                         BPL     S,0102
2041  006626  012737  000101  177560  KBIDUN: MOV     #101,@#TKS      ;RE-INIT, READER
2042  006634  012714  000100                 MOV     #100,(R4)       ;ENABLE TPTR, FOR ECHO
2043  006640  000207                         RTS     PC              ;WILL RESTORE REGS, AND RTI
2044
```

```
                                        ;
                                        ; TPINT - TELEPRINTER INTERUPT HANDLER
                                        ;
                                        ;  USED TO PRINT OUT TEXT AND ECHO TYPE-IN;
                                        ;  TO HANDLE CASE OF PENDING REQUESTS TO DO TEXT OUTPUT
                                        ;    AND ECHO, DOES THE ORDERLY THING BY FOLLOWING THIS
                                        ;    PRIORITY:
                                        ;         IF ECHOSP(R5) SHOWS NEED TO DO 2ND HALF OF PAIRED
                                        ;           CHARS, FOR ECHO (+U, <CR><LF>), DO FIRST,
                                        ;         IF TEXT MESS, IN PROGRESS, FINISH IT (TO <LF>);
                                        ;         ELSE, ECHO,
                                        ;         ELSE, TURN OFF INTERUPTS.
                                        ;
006642  004567  010204          TPINT:  JSR     R5,SAVRGI       ;CAUSE RTI ON REG, RESTORE
006646  016705  0000000                 MOV     USRAREA,R5
006652  105765  000110                  TSTB    FILLCO(R5)
006656  001404                          BEQ     TPNXT
006660  105365  000110                  DECB    FILLCO(R5)
006664  005000                          CLR     R0
006666  000416                          BR      TYPE1
006670  012704  000104          TPNXT:  MOV     #ECHOSP,R4
006674  060504                          ADD     R5,R4           ;SAVED HERE THRU-OUT ROUTINE
006676  005714                          TST     (R4)            ;SPECIAL ECHO IN PROGRESS?
006700  001415                          BEQ     TRYECHO         ;NO
006702  113400                  SPECHES:MOVB    @(R4)+,R0       ;NEXT SP, ECHO CHAR,
006704  001412                          BEQ     CLRECHO
006706  005244                          INC     -(R4)           ;PT, TO NEXT CHAR,
006710  120065  000112          TYPE1:  CMPB    R0,FILLCH(R5)
006714  001003                          BNE     TYPE1
006716  116565  000111  000110          MOVB    FILLNO(R5),FILLCO(R5)
006724  110037  177566          TYPE11: MOVB    R0,@#TPB
006730  000207                          RTS     PC              ;RESTORE REGS, AND RETURN
006732  005044          CLRECHO:CLR     -(R4)
006734  016501  000102          TRYECHO:MOV     KBWD(R5),R1     ;NO MESS, + ECHO?

006740  004767  004424                  JSR     PC,GET2BYT
006744  103011                          BCC     GOTECHO
006746  016501  000100          MSGSUP: MOV     TPWD(R5),R1     ;TRY MESSAGE
006752  004767  004412                  JSR     PC,GET2BYT
006756  103354                          BCC     TYPE            ;GOT ONE! GO DO IT
006760  042737  000100  177564  OFFTYPE:BIC     #100,@#TPS      ;CLEAR INTERUPT
006766  000207                          RTS     PC

006770  004367  001230          GOTECHO:JSR     R3,CHKCHR       ;CHECK THAT ECHO CHAR,
006774  000420                          BR      PRNTDEL         ;LINE DELETE
006776  000422                          BR      SETLFE          ;<CR>; <LF> AS ECHOSP
007000  000424                          BR      ECHOBA          ;RUB OUT; DO "\"
007002  000401                          BR      TPCN
007004  000741                          BR      TYPE
007006  120027  000003          TPCN:   CMPB    R0,#3           ;CHEC ^C
007012  001003                          BNE     TPCO
007014  012714  007073                  MOV     #CCMES,(R4)
007020  000730                          BR      SPECHES
007022  120027  000017          TPCO:   CMPB    R0,#17          ;CHECK ^O
007026  001342                          BNE     TRYECHO
```



```
007030  012714  007076                  MOV     #COMES,(R4)
007034  000722                          BR      SPECHES
                                        ;
007036  012714  007060          PRNTDEL:MOV     #DELMSG,(R4)    ;ST, ADDR, INTO ECHOSP(R5)
007042  000717                          BR      SPECHES
                                        ;
007044  012714  007070          SETLFE: MOV     #CRLFMES,(R4)
007050  000714                          BR      SPECHES
                                        ;
007052  112700  000137          ECHOBA: MOVB    #'\,R0
007056  000714                          BR      TYPE
                                        ;
                                        DELMSG:
007060  042040  046105  052105          .ASCII  ' DELETED'
        007066  042105
007070     015     012     000  CRLFMES:.BYTE   015,012,000
007073     136     103          CCMES:  .ASCII  '^C'
007075     000                          .BYTE 0
007076  047536                  COMES:  .ASCII  '^O'
007100     015     012     000          .BYTE   015,012,000
        007104                          .EVEN
```

```
                                        .IFNDF  $NOPTP
                                ;
                                ; PTRINT - PAPER-TAPE READER INTERUPT HANDLER
                                ;
                                ;  CLEARS PARITY BIT,  FLUSHES 000, RUB-OUT, AND <LF>;
                                ;  IF CHAR, WON'T FIT IN BUFF., SAVE IN BFSPEC (LO BYTE),
                                ;  ON EOT OR OTHER ERROR, SET HI BIT OF BFSPEC;
                                ;
007104  004567  007742          PTRINT: JSR     R5,SAVRG1       ;CAUSE RTI ON REG, RESTORE
007110  012701  021242                  MOV     #PRBFHD,R1      ;FOR PUTBYT
007114  005737  177550                  TST     @#PRS           ;ERRORS?
007120  100425                          BMI     PREOT           ;YES: TREAT AS EOT
007122  113700  177552                  MOVB    @#PRB,R0        ;CHARACTER
007126  042700  177600                  BIC     #177600,R0
007132  001414                          BEQ     EXIT02          ;IGNORE 000 (CAN'T HAPPEN!)
007134  122700  000177                  CMPB    #177,R0         ;RUB OUT?
007140  001411                          BEQ     EXIT02          ;IGNORE
007142  122700  000012                  CMPB    #LF,R0
007146  001406                          BEQ     EXIT02          ;IGNORE LF'S
007150  004767  007430                  JSR     PC,PUTBYT
007154  103003                          BCC     EXIT02          ;GOT IN
007156  110061  000012                  MOVB    R0,BFSPEC(R1)   ;SAVE THIS CHAR,
007162  000207                          RTS     PC              ;RESTORE REGS, AND RTI
007164  012737  000101  177550  EXIT02: MOV     #101,@#PRS      ;RE-ENABLE READER
007172  000207                          RTS     PC
007174  052761  100000  000012  PREOT: BIS     #100000,BFSPEC(R1)      ;SHOW EOT
007202  000207                          RTS     PC
                                        .ENDC
```



```
                                        .IFNDF  $NOPTP
                                ;
                                ; PPINT - PAPER TAPE PUNCH INTERUPT HANDLER
                                ;
                                ;  ON ERROR, MAKE BFSPEC NON-0;
                                ;
007204  004567  007642          PPINT:  JSR     R5,SAVRG1       ;CAUSE RTI AFTER REG, RESTORE
007210  016705  000000G                 MOV     USRAREA,R5
007214  012701  021306                  MOV     #PPBFHD,R1
007220  005737  177554                  TST     @#PPS
007224  100406                          BMI     PPERR
007226  004767  004130                  JSR     PC,GET1BYT
007232  103406                          BCS     NOCHR2          ;NOTHING TO GET
007234  110037  177556                  MOVB    R0,@#PPB
007240  000207                          RTS     PC              ;RESTORE REGS, AND RTI
007242  052761  000001  000012  PPERR:  BIS     #1,BFSPEC(R1)   ;INDIC, ERROR
007250  005037  177554          NOCHR2: CLR     @#PPS           ;CLEAR INTERUPT ENABLE
007254  000207                          RTS     PC
                                ;
                                        .ENDC
```

```
                                        .IFNDF  $NOLPI
                                ;
                                ; LPINT - LINE PRINTER INTERUPT HANDLER
                                ;
007256  004567  007570          LPINT:  JSR     R5,SAVRGI       ;CAUSE RTI AFTER REG, RESTORE
007262  016705  000000G                 MOV     USRAREA,R5
007266  012701  021352                  MOV     #LPBFHD,R1
007272  005737  177514                  TST     @#LPS
007276  100406                          BMI     LPERR
007300  004767  004054                  JSR     PC,GET1BYT
007304  103406                          BCS     LPOFF           ;NOTHIN' THERE
007306  110037  177516                  MOVB    R0,@#LPB        ;WRITE CHAR
007312  000207                          RTS     PC
                                ;
007314  052761  000001  000012  LPERR:  BIS     #1,BFSPEC(R1)   ;RECORD ERROR
007322  005037  177514          LPOFF:  CLR     @#LPS           ;TURN IT OFF FOR AWHILE
007326  000207                          RTS     PC
                                        .ENDC
```



```
                                        .IFNDF  $NOPOW
                                ;
                                ; POWDWN - POWER FAIL/RESTART ROUTINE
                                ;
007330  012737  007340  000024  POWDWN: MOV     #POWUP,@#24
007336  000000                  HALT
                                ;
007340  005000                  POWUP:  CLR     R0      ;INITIALIZE LOOP COUNT
007342  016705  000000G         POWLP:  MOV     USRAREA,R5
007346  012737  007330  000024          MOV     #POWDWN,@#24
007354  016506  000004                  MOV     POL(R5),SP      ;WASTE TIME (AND INIT STACK!)
007360  005300                          DEC     R0              ;COUNT TILL DONE
007362  001367                          BNE     POWLP
007364  000167  171302                  JMP     READY@
                                        .ENDC
                                        .EOT
```

```
2208                                    ;                                       SOURCE FILE #4
2209                                    ;***************************************************
2210                                    ;***************************************************
2211                                    ;***********                             ***********
2212                                    ;***********     CLOSED SUBROUTINES      ***********
2213                                    ;***********                             ***********
2214                                    ;***************************************************
2215                                    ;***************************************************
2216
2217
2218
2219
2220
2221                                    ;-------------------------------------------------
2222                                    ;  SUBROUTINE 'ADDSTK'  CALLED BY JSR PC
2223                                    ;                       ADDS (SP)+,(SP)+ TO FAC1(R5),FAC2(R5) WATCHING TYPE
2224                                    ;                       R0,R1  UNUSED
2225                                    ;                       R2,R3  DESTROYED
2226                                    ;                       R4  MODIFIED TO REFLECT STACK USAGE
2227                                    ;                       R5  MUST POINT TO USER AREA
2228                                    ;                       SP  GOES ?? DEEPER AFTER JSR
2229  007370  012603                   ADDSTK: MOV     (SP)+,R3
2230  007372  004767  003576                   JSR     PC,FIXUP
2231  007376  001414                           BEQ     ADDINT
2232  007400  012767  011666  000000G          MOV     #ERADD,$ERVEC
2233  007406  004467  003722                   JSR     R4,FPPSAV
2234  007412  014256                           ,WORD   PUSH
2235  007414  000000G                          ,WORD   $ADR
2236  007416  014270                           ,WORD   POP
2237  007420  013306                           ,WORD   FPPRES
2238  007422  005765  000040                   TST     FAC1(R5)
2239  007426  000113                           JMP     (R3)            ;COND CODES=SGN(RESULT)
2240  007430  005726                   ADDINT: TST     (SP)+
2241  007432  012602                           MOV     (SP)+,R2
2242  007434  066502  000042                   ADD     FAC2(R5),R2
2243  007440  102403                           BVS     ADDOVF
2244  007442  010265  000042                   MOV     R2,FAC2(R5)
2245  007446  000113                           JMP     (R3)            ;COND CODES=SGN(RESULT)
2246  007450  100425                   ADDOVF: BMI     ADDPOS
2247  007452  001416                           BEQ     ADDZERO
2248  007454  005402                           NEG     R2
2249  007456  105065  000042                   CLRB    FAC2(R5)
2250  007462  110265  000043                   MOVB    R2,FAC2+1(R5)
2251  007466  000302                           SWAB    R2
2252  007470  110265  000040                   MOVB    R2,FAC1(R5)
2253  007474  105065  000041                   CLRB    FAC1+1(R5)
2254  007500  062765  143600  000040          ADD     #143600,FAC1(R5)
2255  007506  000113                           JMP     (R3)            ;COND CODES=SGN(RESULT)
2256  007510  005065  000042           ADDZERO:CLR     FAC2(R5)
2257  007514  012765  144200  000040          MOV     #144200,FAC1(R5)
2258  007522  000113                           JMP     (R3)            ;COND CODES=SGN(RESULT)
2259  007524  105065  000042           ADDPOS: CLRB    FAC2(R5)
2260  007530  110265  000043                   MOVB    R2,FAC2+1(R5)
2261  007534  000302                           SWAB    R2
2262  007536  110265  000040                   MOVB    R2,FAC1(R5)
```



```
2263  007542  105065  000041                   CLRB    FAC1+1(R5)
2264  007546  062765  043600  000040          ADD     #43600,FAC1(R5)
2265  007554  000113                           JMP     (R3)            ;COND CODES=SGN(RESULT)
2266
```

```
2267                                    ;+-----------------------------------------------------
2268                                    ;  SUBROUTINE 'ALLOC'   CALLED BY JSR PC
2269                                    ;                       ALLOCATES ARRAY SPACE FROM FREESPACE
2270                                    ;                       R0,R1  PRESERVED
2271                                    ;                       R2  MUST POINT TO VAR    GETS DESTROYED
2272                                    ;                       R3  MUST CONTAIN SS1MAX   GETS DESTROYED
2273                                    ;                       R4  MUST CONTAIN SS2MAX    GETS DESTROYED
2274                                    ;                       R5  MUST POINT TO USER AREA
2275                                    ;                       SP  GOES ?? DEEPER AFTER JSR
2276 007556  010046                    ALLOC:  MOV     R0,-(SP)
2277 007560  010146                            MOV     R1,-(SP)
2278 007562  005203                            INC     R3
2279 007564  010401                            MOV     R4,R1
2280 007566  005201                            INC     R1
2281 007570  001776                            BEQ     .-2
2282 007572  005000                            CLR     R0                      ;****
2283 007574  012746  000020                    MOV     #20,-(SP)               ;*  *
2284 007600  006301                    ALLLOOP:ASL     R1                      ;*  *
2285 007602  103002                            BCC     ALLNOAD                 ;*  *
2286 007604  060300                            ADD     R3,R0                   ;*  *  MULTIPLY (R1)*(R3)*2
2287 007606  103447                            BCS     ERRARAY                 ;*  *  RESULT IN R0
2288 007610  006300                    ALLNOAD:ASL     R0                      ;*  *  WATCH FOR OVERFLOWS
2289 007612  103445                            BCS     ERRARAY                 ;*  *
2290 007614  005316                            DEC     (SP)                    ;*  *
2291 007616  003370                            BGT     ALLLOOP                 ;*  *
2292 007620  005726                            TST     (SP)+                   ;****
2293 007622  062700  000002                    ADD     #2,R0
2294 007626  103437                            BCS     ERRARAY         ;R0 NOW = 2 TIMES # ELEMENTS NEEDED,
2295
2296                                            .IFNDF  $NOSTR
2297                                            CMP     (R2),#,SVAR
2298                                            BEQ     .+6
2299                                            .ENDC
2300
2301 007630  006300                            ASL     R0
2302 007632  103435                            BCS     ERRARAY         ;R0 NOW = # BYTES NEEDED,
2303 007634  016501  000012                    MOV     HIFREE(R5),R1
2304 007640  160001                            SUB     R0,R1
2305 007642  103431                            BCS     ERRARAY
2306 007644  020165  000074                    CMP     R1,HISTR(R5)
2307 007650  103426                            BLO     ERRARAY
2308 007652  005721                            TST     (R1)+
2309 007654  000401                            BR      .+4
2310 007656  005021                            CLR     (R1)+
2311 007660  020165  000012                    CMP     R1,HIFREE(R5)
2312 007664  101774                            BLOS    .-6
2313 007666  160001                            SUB     R0,R1
2314
2315                                            .IFNDF  $NOSTR
2316                                            CMP     (R2),#,SVAR
2317                                            BEQ     ALLSTRN
2318                                            .ENDC
2319
2320 007670  012722  177776                    MOV     #,NVAR,(R2)+
2321 007674  012221                            MOV     (R2)+,(R1)+
```



```
2322 007676  012221                            MOV     (R2)+,(R1)+
2323 007700  010412                            MOV     R4,(R2)
2324 007702  005303                            DEC     R3
2325 007704  010342                            MOV     R3,-(R2)
2326 007706  010142                            MOV     R1,-(R2)
2327 007710  162712  000004                    SUB     #4,(R2)
2328
2329                                            .IFNDF  $NOSTR
2330                                            BR      ALLEXIT
2331                                    ALLSTRN:TST     (R2)+
2332                                            MOV     (R2)+,(R1)+
2333                                            DEC     R3
2334                                            MOV     R3,(R2)+
2335                                            MOV     R4,(R2)
2336                                            MOV     R1,-4(R2)
2337                                            SUB     #2,-4(R2)
2338                                            MOV     #-1,(R1)+
2339                                            CMP     R1,HIFREE(R5)
2340                                            BLOS    .-10
2341                                            SUB     R0,R1
2342                                            MOV     (R1),R2
2343                                            INC     R2
2344                                            BEQ     ALLEXIT
2345                                            SWAB    R1
2346                                            MOVB    R1,(R2)+
2347                                            SWAB    R1
2348                                            MOVB    R1,(R2)
2349                                            .ENDC
2350
2351 007714  160065  000012            ALLEXIT:SUB     R0,HIFREE(R5)
2352 007720  012601                            MOV     (SP)+,R1
2353 007722  012600                            MOV     (SP)+,R0
2354 007724  000207                            RTS     PC
2355 007726  000004                    ERRARAY:IOT
2356                                            .IFNDF  $LONGER
2357 007730  052101      114                   .ASCII  \ATL\
2358                                            .ENDC
2359                                            .IFDF   $LONGER
2360                                            .ASCII  'ARRAYS TOO LARGE'
2361                                            .ENDC
2362 007733      000                           .BYTE 0
2363                                            .EVEN
2364
```

```
                                        .IFNDF  $NOSTM
                                ;*******************************************
                                ;  'ARGB' SUBROUTINE
                                ;                       CALLED BY JSR R7
                                ;                       CALLS EVAL TO GET A 1-BYTE
                                ;                       ARGUMENT, BRANCHES TO ERRARG
                                ;                       IF ARG NO GOOD
                                ;
007734  000004          ARGB:   JSR     PC,EVAL
                                BCS     ERRARG
                                JSR     PC,INT
                                TST     FAC1(R5)
                                BNE     ERRARG
                                TSTB    FAC2+1(R5)
                                BNE     ERRARG
                                RTS     PC
                                .ENDC

                        ERSQR:
                        ERLOG:
007734  000004          ERRARG: IOT
                                .IFDF   $LONGER
                                .ASCII  'ARGUMENT ERROR'
                                .ENDC
                                .IFNDF  $LONGER
007736  051101     107          .ASCII  'ARG'
                                .ENDC
007741     000                  .BYTE   0
                                .EVEN
```



```
                                ;*******************************************
                                ;  SUBROUTINE 'BOMB'    CALLED BY IOT
                                ;                       PRINTS ERROR MESSAGE FROM AFTER IOT
                                ;                       R0  DESTROYED
                                ;                       R1  PRESERVED
                                ;                       R2,R3,R4  UNUSED
                                ;                       R5  MUST POINT TO USER AREA
                                ;                       SP  RESET TO EMPTY STACK
                                ;                       PC  DOES NOT RETURN
007742  011601          BOMB:   MOV     (SP),R1
007744  016705  000000G         MOV     USRAREA,R5
007750  016506  000004          MOV     PDL(R5),SP
007754  005065  000076          CLR     ODEV(R5)        ;CAUSE MES OUTPUT TO TTY
007760  012765  000036  000034  MOV     #CLMNITY,COLUMN(R5)     ;SET-UP TTY FOR COL, COUNT
007766  060565  000034          ADD     R5,COLUMN(R5)
007772  004167  005476          JSR     R1,MSG
007776     015     012          .BYTE   CR,LF
                                .IFNDF  $LONGER
010000     045                  .ASCII  '%'
                                .ENDC
010001     000                  .BYTE 0
                                .EVEN
010002  112100          BOMBNX: MOVB    (R1)+,R0
010004  001403                  BEQ     BOMBOON
010006  004767  006664          JSR     PC,PUTCHAR
010012  000773                  BR      BOMBNX
010014  026527  000030  177775  BOMBOON:CMP     LINENO(R5),#SCALAR
010022  103041                  BHIS    BOMBJMP
010024  004167  005444          JSR     R1,MSG
010030  040440  020124  044514  .ASCII  ' AT LINE '
010036  042516     040
010041     000                  .BYTE 0
                                .EVEN
010042  016500  000030          MOV     LINENO(R5),R0
010046  002405                  BLT     BOMBNEG
010050  010065  000042          MOV     R0,FAC2(R5)
010054  005065  000040          CLR     FAC1(R5)
010060  000414                  BR      BOMBOK
010062  110065  000043  BOMBNEG:MOVB    R0,FAC2+1(R5)
010066  105065  000042          CLRB    FAC2(R5)
010072  000300                  SWAB    R0
010074  110065  000040          MOVB    R0,FAC1(R5)
010100  105065  000041          CLRB    FAC1+1(R5)
010104  062765  043600  000040  ADD     #43600,FAC1(R5)
010112  004767  005630  BOMBOK: JSR     PC,NUMOUT
010116  004167  005352          JSR     R1,MSG
010122     015     012     000  .BYTE   CR,LF,0
                        010126  .EVEN
010126  000167  170744  BOMBJMP:JMP     READY
```

```
2443                                    ;
2444                                    ; BUFCLR--INIT I/O DEV, BUFFER HEADERS
2445                                    ;
2446                                    ; CALL: JSR     PC,BUFCLR
2447                                    ;
2448                                    ; USES R2 AND R3
2449                                    ;
2450  010132  016502  000102           BUFCLR: MOV     KBHD(R5),R2     ;KEYBOARD
2451  010136  012203                    MOV     (R2)+,R3        ;BUFF, START
2452  010140  005722                    TST     (R2)+           ;SKIP TO BGET1
2453  010142  010322                    MOV     R3,(R2)+
2454  010144  010322                    MOV     R3,(R2)+
2455  010146  010322                    MOV     R3,(R2)+
2456  010150  004767  000032            JSR     PC,BUFTP        ;CLEAR TELEPRINTER BUFFER
2457                                    
2458                                    .IFNDF  $NOPTP
2459  010154  012702  021306            MOV     #PPBFHD,R2      ;PAPER TAPE PUNCH
2460  010160  004767  003562            JSR     PC,INITBF
2461  010164  012702  021242            MOV     #PRBFHD,R2      ;PAPER TAPE READER
2462  010170  004767  003552            JSR     PC,INITBF
2463                                    .ENDC
2464                                    .IFNDF  $NOLPT
2465  010174  012702  021352            MOV     #LPBFHD,R2
2466  010200  004767  003542            JSR     PC,INITBF
2467                                    .ENDC
2468
2469  010204  000207                    RTS     PC
2470
2471
2472                                    ;
2473                                    ; BUFTP--INIT TELEPRINTER BUFFER HEADER
2474                                    ;
2475                                    ; CALL: JSR     PC,BUFTP
2476                                    ;
2477                                    ; USES R2 AND R3
2478                                    ;
2479  010206  016502  000100           BUFTP:  MOV     TPHD(R5),R2     ;TELEPRINTER
2480  010212  012203                    MOV     (R2)+,R3        ;BUFF, START
2481  010214  022222                    CMP     (R2)+,(R2)+     ;PT, TO BGET2
2482  010216  010322                    MOV     R3,(R2)+
2483  010220  010322                    MOV     R3,(R2)+
2484  010222  000207                    RTS     PC
2485
```



```
2486                                    ;
2487                                    ;
2488                                    ; CHKCHR - CHECK ASCII CHAR, FOR SPECIAL CASES
2489                                    ;
2490                                    ; CALL: MOV     @CHAR,R0
2491                                    ;       JSR     R3,CHKCHR
2492                                    ;       INSTRUC,        ;EXECUTE IF LINE DEL, (<ALT MODE>,^U)
2493                                    ;       INSTRUC,        ;EXEC, IF <CR>
2494                                    ;       INSTRUC,        ;EXEC, IF <RUB OUT> (OR ^?)
2495                                    ;       INSTRUC,        ;EXEC, IF BELOW 40 OR ABOVE 137
2496                                    ;       INSTRUC,        ;EXEC, IF GOOD STUFF
2497                                    ;
2498                                    ;  USES R0
2499                                    ;
2500  010224  120027  000176           CHKCHR: CMPB    R0,#176         ;ALT MODE
2501  010230  001434                    BEQ     CCEXIT
2502  010232  120027  000175            CMPB    R0,#175         ;ALT MODE
2503  010236  001431                    BEQ     CCEXIT
2504  010240  120027  000033            CMPB    R0,#33          ;ALT MODE
2505  010244  001426                    BEQ     CCEXIT
2506  010246  120027  000025            CMPB    R0,#25          ;^U
2507  010252  001423                    BEQ     CCEXIT
2508  010254  005723                    TST     (R3)+           ;TO <CR> RETURN
2509  010256  120027  000015            CMPB    R0,#CR
2510  010262  001417                    BEQ     CCEXIT
2511  010264  005723                    TST     (R3)+           ;TO RUB OUT RETURN
2512  010266  120027  000177            CMPB    R0,#177         ;RUB OUT
2513  010272  001413                    BEQ     CCEXIT
2514  010274  120027  000137            CMPB    R0,#'_
2515  010300  001410                    BEQ     CCEXIT
2516  010302  005723                    TST     (R3)+           ;TO LIMIT RETURN
2517  010304  120027  000040            CMPB    R0,#40
2518  010310  103404                    BLO     CCEXIT
2519  010312  120027  000137            CMPB    R0,#137
2520  010316  101001                    BHI     CCEXIT
2521  010320  005723                    TST     (R3)+           ;REG, CHAR, RETURN
2522  010322  000203                   CCEXIT: RTS     R3
2523
```

```
                                        ;
                                        ; CHKISET - CHECK I/O CHANNEL AND SET-UP INPUT (IDEV(R5))
                                        ; CHKOSET - CHECK I/O CHANNEL AND SET-UP OUTPUT (ODEV(R5))
                                        ;
                                        ; CALL: MOV     CADDR; OF CODE LINE PTR, AFTER '#'],R1
                                        ;       JSR     PC,CHKISET (CHKOSET)
                                        ;
                                        ;  USES: R0,R1,R2,R3,R5
                                        ;
                                        ;  CHECK IF SPECIFIED CHANNEL LEGAL (NUMBER IN RANGE AND I/O
                                        ;   DEVICE ASSEMBLED IN),  RETURN CODE FOR SPECIFIED DEVICE
                                        ;   (SAME AS VALUE OF IDEV (ODEV)) IN R2,  ON EXIT, R1 PTS;
                                        ;   TO BYTE AFTER CHANNEL NUMBER.
                                        ;
010324  012700  010421          CHKISET:MOV     #ITABLE,R0
010330  000402                         BR      COMCHK
010332  012700  010416          CHKOSET:MOV     #OTABLE,R0
010336  004767  000254          COMCHK: JSR     PC,EVAL
010342  103420                         BCS     ERRX12
010344  005765  000040                 TST     FAC1(R5)
010350  001017                         BNE     ERCHAN          ;MUST BE INTEGER
010352  016502  000042                 MOV     FAC2(R5),R2
010356  001411                         BEQ     OUT012          ;TTY - EVERYTHING SET-UP
010360  111003                         MOVB    (R0),R3         ;FIRST TABLE ENTRY
010362  060503                         ADD     R5,R3           ;PTS, TO ACTUAL BYTE
010364  020227  000002                 CMP     R2,#2           ;MAX CHANNEL NUMBER (CURRENTLY)
010370  101007                         BHI     ERCHAN
010372  060200                         ADD     R2,R0           ;ENTRY IN TABLE OF DEV; CODE
010374  111013                         MOVB    (R0),(R3)       ;CODE INTO IDEV OR ODEV
010376  001404                         BEQ     ERCHAN          ;MEANS NO DEVICE THERE
010400  111002                         MOVB    (R0),R2
010402  000207          OUT012: RTS     PC
                                        ;
010404  000167  001240          ERRX12: JMP     ERRSX9
                                        ;
010410  000004                 ERCHAN: IOT
                                        ;IFNDF  $LONGER
010412  041504      105                ;ASCII  \DCE\
                                        ;ENDC
                                        ;IFDF   $LONGER
                                        ;ASCII  'DEVICE CHANNEL ERROR'
                                        ;ENDC
010415      000                         ;BYTE   0
                                        ;EVEN
                                        ;
                                        ;
010416      076                 OTABLE: ;BYTE   ODEV
                                        ;IFDF   $NOPTP
                                        ;BYTE   0
                                        ;ENDC
                                        ;IFNDF  $NOPTP
010417      002                 ;BYTE   2
                                        ;ENDC
                                        ;IFDF   $NOLPI
                                        ;BYTE   0
```



```
                                        ;ENDC
                                        ;IFNDF  $NOLPI
010420      004                 ;BYTE   4
                                        ;ENDC
                                        ;
010421      077                 ITABLE: ;BYTE   IDEV
                                        ;IFDF   $NOPTP
                                        ;BYTE   0
                                        ;ENDC
                                        ;IFNDF  $NOPTP
010422      002                 ;BYTE   2
                                        ;ENDC
010423      000                 ;BYTE   0
```

```
2593                                    ;*-------------------------------------------------
2594                                    ;  SUBROUTINE 'CLRVARS' CALLED BY JSR PC
2595                                    ;                       CLEARS VARS TO SCALAR ZEROS,NULL STRINGS
2596                                    ;                       ALSO INITIALIZES RANDOM NO GEN
2597                                    ;                       R0  DESTROYED
2598                                    ;                       R1,R2,R3,R4  UNUSED
2599                                    ;                       R5  MUST POINT TO USER AREA
2600                                    ;                       SP  GOES NO DEEPER AFTER JSR
2601  010424  012765  032331  000064  CLRVARS:MOV     #32331,RND1(R5)
2602  010432  012765  163251  000066          MOV     #163251,RND2(R5)
2603  010440  011500                  CLRLOOP:MOV     (R5),R0
2604  010442  020065  000014                  CMP     R0,LOFREE(R5)
2605  010446  103014                          BHIS    CLRFREE
2606  010450  021027  177775                  CMP     (R0),#,SCALAR
2607  010454  103405                          BLO     CLROK
2608
2609                                          ,IFNDF  $NOSTR
2610                                          CMP     (R0),#,SVAR
2611                                          BEQ     CLRSVAR
2612                                          ,ENDC
2613
2614  010456  012720  177775                  MOV     #,SCALAR,(R0)+
2615  010462  005010                          CLR     (R0)
2616
2617                                          ,IFNDF  $NOSTR
2618                                          BR      ,+4
2619                                  CLRSVAR:MOV     (R0)+,(R0)
2620                                          ,ENDC
2621
2622  010464  012010                          MOV     (R0)+,(R0)
2623  010466  012010                          MOV     (R0)+,(R0)
2624  010470  062700  000004          CLROK:  ADD     #4,R0
2625  010474  000762                          BR      CLRLOOP
2626  010476  005020                          CLR     (R0)+
2627  010500  020065  000010          CLRFREE:CMP     R0,ARRAYS(R5)
2628  010504  101774                          BLOS    ,-6
2629  010506  016565  000010  000012          MOV     ARRAYS(R5),HIFREE(R5)
2630  010514  016565  000014  000072          MOV     LOFREE(R5),LOSTR(R5)
2631  010522  016565  000014  000074          MOV     LOFREE(R5),HISTR(R5)    ;EMPTY STRING STORAGE
2632  010530  012765  000033  000032          MOV     #33,GSBCTR(R5)
2633  010536  016500  000004                  MOV     @L(R5),R0
2634  010542  012720  177777                  MOV     #-1,(R0)+
2635  010546  005020                          CLR     (R0)+
2636  010550  020065  000002                  CMP     R0,LIMIT(R5)
2637  010554  101774                          BLOS    ,-6
2638  010556  000207                          RTS     PC
2639
```



```
2640                                    ;*-------------------------------------------------
2641                                    ;  SUBROUTINE 'DIVTEN'  CALLED BY JSR PC
2642                                    ;                       DIVIDES R3,R4 BY DECIMAL 10
2643                                    ;                       R0,R1,R2  UNUSED
2644                                    ;                       R3,R4  IS THE 31 BIT UNSIGNED INTEGER TO DIVIDE
2645                                    ;                       R5  UNUSED
2646                                    ;                       SP  GOES 2 DEEPER AFTER JSR
2647  010560  012746  000034          DIVTEN: MOV     #34,-(SP)
2648  010564  022703  050000          DIVLOOP:CMP     #50000,R3
2649  010570  101002                          BHI     ,+6
2650  010572  062703  130000                  ADD     #130000,R3
2651  010576  006104                          ROL     R4
2652  010600  006103                          ROL     R3
2653  010602  005316                          DEC     (SP)
2654  010604  003367                          BGT     DIVLOOP
2655  010606  042703  170000                  BIC     #170000,R3
2656  010612  005726                          TST     (SP)+
2657  010614  000207                          RTS     PC
2658
```

```
                        .IFNDF  $NOSTK
                ;-------------------------------------------------
                ;  SUBROUTINE 'DNPACK'  CALLED BY JSR PC
                ;                       PACKS STRING STORAGE TOWARD LOW CORE
                ;                       R0  UNUSED
                ;                       R1,R2,R3  PRESERVED
                ;                       R4  UNUSED
                ;                       R5  MUST POINT TO USER AREA
                ;                       SP  GOES 10 DEEPER AFTER JSR
DNPACK: MOV     R1,-(SP)        ;TO UNDERSTAND THESE ROUTINES IT IS HELPFUL TO
        MOV     R2,-(SP)        ;KNOW THAT NON-NULL STRINGS ARE STORED AS
        MOV     R3,-(SP)        ;(LENGTH,2 BYTE BACKPTR,N BYTE STRING,LENGTH)
        CLR     -(SP)   ;WHERE LENGTH IS THE VALUE OF N AND IF BACKPTR
        MOV     LOSTR(R5),R2    ;IS ODD,THEN IT IS RELATIVE TO SYMBOLS,
        MOV     LOFREE(R5),R1
        MOV     R1,LOSTR(R5)
DNPLOOP:CLR     (SP)
        BISB    (R2)+,(SP)
        BNE     DNPNZRO
DNPBAD: CMP     R2,HISTR(R5)
        BLO     DNPLOOP
        MOV     R1,HISTR(R5)    ;SAVE HIGH STRING ADDRESS
        TST     (SP)+
        MOV     (SP)+,R3
        MOV     (SP)+,R2
        MOV     (SP)+,R1
        RTS     PC
DNPNZRO:CLR     R3
        BISB    (R2)+,R3
        SWAB    R3
        BISB    (R2)+,R3
        ADD     (SP),R2
        INC     R2
        BIT     R3,#1
        BEQ     .+6
        DEC     R3
        ADD     (R5),R3
        CMP     R3,POL(R5)
        BHIS    DNPBAD
        CMP     R3,SP
        BHIS    DNPGOOD
        CMP     R3,ARRAYS(R5)
        BHI     DNPBAD
        CMP     R3,HIFREE(R5)
        BHI     DNPGOOD
        CMP     R3,LOFREE(R5)
        BHIS    DNPBAD
        CMP     R3,(R5)
        BLO     DNPBAD
DNPGOOD:ADD     #4,(SP)
        SUB     (SP),R2
        CMP     R2,(R3)
        BNE     DNPIGNO
        MOV     R1,(R3)
        MOVB    (R2)+,(R1)+
```



```
        DEC     (SP)
        BGT     .-4
        BR      DNPBAD
DNPIGNO:ADD     (SP),R2
        BR      DNPBAD
        .ENDC
        .EOT
```

```
                                        ;                                       SOURCE FILE #5
                                        ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                        ;
                                        ; EVAL - EVALUATE EXPRESSION
                                        ;
                                        ; CALL: MOV     [USER-AREA]
                                        ;       MOV     [STACK SIZE],R4
                                        ;       MOV     [CHAR. PTR.],R1
                                        ;       JSR     PC,EVAL
                                        ;
                                        ;  USES ALL REGS.
                                        ;
                                        ;  RETURNS 'C' BIT SET IF STRING VAL.
                                        ;                 CLR IF NOT STRING
                                        ;
                                        ;  RETURNS VALUE IN FAC1(R5), FAC2(R5)
                                        ;
010616 020604          EVAL:  CMP     SP,R4
010620 103406                 BLO     BPDL
010622 012746 000235          MOV     #,TERM,-(SP)
010626 000404                 BR      OPERAND
010630 012746 000233   UMINUS: MOV     #,UNARY,-(SP)
010634 020604                 CMP     SP,R4
010636 103530          BPDL:  BLO     ERRPDL
010640 112102          OPERAND:MOVB    (R1)+,R2
010642 002113                 BGE     VARBLE
010644 120227 000375          CMPB    R2,#,ILIT1
010650 001455                 BEQ     ILIT1
010652 120227 000376          CMPB    R2,#,ILIT2
010656 001462                 BEQ     ILIT2
010660 120227 000374          CMPB    R2,#,FLIT
010664 001462                 BEQ     FLIT
010666 120227 000255          CMPB    R2,#,LPAR
010672 001470                 BEQ     LPAR
010674 120227 000234          CMPB    R2,#,MINUS
010700 001753                 BEQ     UMINUS
010702 120227 000232          CMPB    R2,#,PLUS
010706 001754                 BEQ     OPERAND
010710 120227 000262          CMPB    R2,#,FN
010714 001504                 BEQ     GOTOFN

                              ,IFNDF  $NOSTR
                              CMPB    R2,#,$QUOT
                              BEQ     GOTOQT
                              CMPB    R2,#,DQUOT
                              BNE     NOQUOTE
                       GOTOQT: JMP    QUOTE
                              ,ENDC

010716 042702 177400   NOQUOTE:BIC    #177400,R2
010722 162702 000003          SUB     #,RNDL,R2
010726 006302                 ASL     R2
010730 020227 000024          CMP     R2,#TBL5END-TABLE5
010734 101054                 BHI     ERRSX4
010736 062702 000012          ADD     #12,R2
```



```
010742 060702                 ADD     PC,R2
010744 005712                 TST     (R2)
010746 003002                 BGT     .+6
010750 000167 002042          JMP     ERRUFN
010754 061207                 ADD     (R2),PC
010756 000000          TABLE5: .WORD   0               ; RND(
010760 000000                 .WORD   0               ; RND
010762 000716                 .WORD   SINFN-TABLE5
010764 000724                 .WORD   COSFN-TABLE5
010766 000732                 .WORD   SQRFN-TABLE5
010770 000746                 .WORD   ATNFN-TABLE5
010772 000754                 .WORD   EXPFN-TABLE5
010774 000770                 .WORD   LOGFN-TABLE5
010776 000000                 .WORD   0               ; ABS
011000 001122                 .WORD   INTFN-TABLE5
011002 000000                 .WORD   0               ; SGN

                              ,IFNDF  $NOSTR
                              .WORD   0               ; TAB
                              .WORD   0               ; LEN
                              .WORD   0               ; ASC
                              .WORD   0               ; CHR$
                              .WORD   0               ; POS
                              .WORD   0               ; SEG
                              .WORD   0               ; VAL
                              .WORD   0               ; STR
                              ,ENDC

                       TBL5END =.-2
011004 005065 000040   ILIT1:  CLR     FAC1(R5)
011010 105065 000043          CLRB    FAC2+1(R5)
011014 112165 000042          MOVB    (R1)+,FAC2(R5)
011020 000167 000246          JMP     OPRATOR
011024 005065 000040   ILIT2:  CLR     FAC1(R5)
011030 000404                 BR      ILITCOM
011032 112165 000041   FLIT:   MOVB    (R1)+,FAC1+1(R5)
011036 112165 000040          MOVB    (R1)+,FAC1(R5)
011042 112165 000043   ILITCOM:MOVB    (R1)+,FAC2+1(R5)
011046 112165 000042          MOVB    (R1)+,FAC2(R5)
011052 000507                 BR      OPRATOR
011054 004767 177536   LPAR:   JSR     PC,EVAL

                              ,IFNDF  $NOSTR
                              BCS     LPSTRNG
                              ,ENDC

011060 122127 000237          CMPB    (R1)+,#,RPAR
011064 001502                 BEQ     OPRATOR
011066 000167 000556   ERRSX4: JMP     ERRSX5

                              ,IFNDF  $NOSTR
                       LPSTRNG:CMPB   (R1)+,#,RPAR
                              BNE     ERRSX4
                              JMP     SOPRATR
                              ,ENDC
```

```
 2832
 2833  011072  000332                VARBLE: SWAB    R2
 2834  011074  152102                        BISB    (R1)+,R2
 2835  011076  061502                        ADD     (R5),R2         ;COLLECT OFFSET
 2836  011100  121127  000255                CMPB    (R1),#LPAR
 2837  011104  001412                        BEQ     VARSS
 2838
 2839                                        .IFNDF  $NOSTM
 2840                                        CMP     (R2),#SVAR
 2841                                        BEQ     STRGJMP
 2842                                        .ENDC
 2843
 2844  011106  022227  177775                CMP     (R2)+,#SCALAR
 2845  011112  001403                        BEQ     VARNOSS
 2846  011114  011202                        MOV     (R2),R2
 2847  011116  000401                        BR      VARNOSS
 2848
 2849                                        .IFNDF  $NOSTM
 2850                                STRGJMP:JMP     STRGVAR
 2851                                        .ENDC
 2852
 2853  011120  000004                ERRPDL: IOT
 2854                                        .IFNDF  $LONGER
 2855  011122  052105     103                .ASCII  \ETC\
 2856                                        .ENDC
 2857                                        .IFDF   $LONGER
 2858                                        .ASCII  /EXPRESSION TOO COMPLEX/
 2859                                        .ENDC
 2860  011125     000                     .BYTE 0
 2861                                        .EVEN
 2862  011126  000167  001540        GOTOFN: JMP     FNFN
 2863
 2864                                        .IFNDF  $NOSTM
 2865                                ERRMX2: JMP     ERRMIX
 2866                                        .ENDC
 2867
 2868  011132  005201                VARSS:  INC     R1
 2869  011134  003771                        BLE     ERRPDL
 2870  011136  010246                        MOV     R2,-(SP)
 2871  011140  004767  177452                JSR     PC,EVAL
 2872
 2873                                        .IFNDF  $NOSTM
 2874                                        BCS     ERRMX2
 2875                                        .ENDC
 2876
 2877  011144  004767  002634                JSR     PC,INT
 2878  011150  005765  000040                TST     FAC1(R5)
 2879  011154  001027                        BNE     ERRSS2
 2880  011156  121127  000237                CMPB    (R1),#RPAR
 2881  011162  001426                        BEQ     VONESS
 2882  011164  122127  000243                CMPB    (R1)+,#COMMA
 2883  011170  001336                        BNE     ERRSX4
 2884  011172  016546  000042                MOV     FAC2(R5),-(SP)
 2885  011176  004767  177414                JSR     PC,EVAL
 2886
```



```
 2887                                        .IFNDF  $NOSTM
 2888                                        BCS     ERRMX2
 2889                                        .ENDC
 2890
 2891  011202  004767  002576                JSR     PC,INT
 2892  011206  005765  000040                TST     FAC1(R5)
 2893  011212  001010                        BNE     ERRSS2
 2894  011214  122127  000237                CMPB    (R1)+,#RPAR
 2895  011220  001322                        BNE     ERRSX4
 2896  011222  016503  000042                MOV     FAC2(R5),R3
 2897  011226  100402                        BMI     ERRSS2
 2898  011230  012600                        MOV     (SP)+,R0
 2899  011232  000407                        BR      VTWOSS
 2900  011234  000167  003534        ERRSS2: JMP     ERRSS3
 2901  011240  005201                VONESS: INC     R1
 2902  011242  012703  177777                MOV     #-1,R3
 2903  011246  016500  000042                MOV     FAC2(R5),R0
 2904  011252  100770                VTWOSS: BMI     ERRSS2
 2905  011254  012602                        MOV     (SP)+,R2
 2906
 2907                                        .IFNDF  $NOSTM
 2908                                        CMP     (R2),#SVAR
 2909                                        BNE     .+6
 2910                                        JMP     STRGARR
 2911                                        .ENDC
 2912
 2913  011256  004767  003336                JSR     PC,LOCGET
 2914  011262  012265  000040        VARNOSS:MOV     (R2)+,FAC1(R5)
 2915  011266  011265  000042                MOV     (R2),FAC2(R5)
 2916  011272  111103                OPRATOR:MOVB    (R1),R3         ;NEXT CHARACTER,
 2917  011274  120327  000201                CMPB    R3,#,EOL
 2918  011300  001437                        BEQ     DOITNOW
 2919  011302  120327  000205                CMPB    R3,#,GOTO
 2920  011306  001434                        BEQ     DOITNOW
 2921  011310  120327  000227                CMPB    R3,#,UPARRO
 2922  011314  103664                        BLO     ERRSX4
 2923  011316  011602                        MOV     (SP),R2         ;PREVIOUS OPERATOR,
 2924  011320  120227  000227                CMPB    R2,#,UPARRO
 2925  011324  101425                        BLOS    DOITNOW         ;JUMP IF ^,
 2926  011326  120227  000231                CMPB    R2,#,SLASH
 2927  011332  101417                        BLOS    PREC2           ;JUMP IF * OR /,
 2928  011334  120227  000234                CMPB    R2,#,MINUS
 2929  011340  101411                        BLOS    PREC3           ;JUMP IF + - OR UNARY,
 2930  011342  120227  000254                CMPB    R2,#,EQ
 2931  011346  101403                        BLOS    PREC4           ;JUMP IF = <> <= >= < OR >,
 2932  011350  120327  000254        PREC5:  CMPB    R3,#,EQ
 2933  011354  101427                        BLOS    NOTNOW          ;JUMP IF ANY OPERATOR,
 2934  011356  120327  000234        PREC4:  CMPB    R3,#,MINUS
 2935  011362  101424                        BLOS    NOTNOW          ;JUMP IF + - UNARY * /  OR ^,
 2936  011364  120327  000231        PREC3:  CMPB    R3,#,SLASH
 2937  011370  101421                        BLOS    NOTNOW          ;JUMP IF * / OR ^,
 2938  011372  120327  000227        PREC2:  CMPB    R3,#,UPARRO
 2939  011376  101416                        BLOS    NOTNOW          ;JUMP IF ^,
 2940  011400  005002                DOITNOW:CLR     R2              ;(E,G,  A*B+ ) DO THE * NOW,
 2941  011402  152602                        BISB    (SP)+,R2
```

```
 2942  011404  162702  000226          SUB     #,UPARRO-1,R2
 2943  011410  060202                  ADD     R2,R2
 2944  011412  060702                  ADD     PC,R2                   ;JUMP TO DO THE APPROPRIATE OPERATION,
 2945  011414  061207                  ADD     (R2),PC                 ;LEFT OPERAND IS @(SP),2(SP),
 2946  011416  000510          TABLE2: ,WORD   UPARRO-TABLE2           ;RIGHT OPERAND IS FAC1(R5),FAC2(R5),
 2947  011420  000124                  ,WORD   STAR-TABLE2
 2948  011422  000154                  ,WORD   SLASH-TABLE2
 2949  011424  000116                  ,WORD   PLUS-TABLE2
 2950  011426  000056                  ,WORD   UNARY-TABLE2
 2951  011430  000052                  ,WORD   MINUS-TABLE2
 2952  011432  000042                  ,WORD   TERMIN-TABLE2
 2953  011434  016546  000042  NOTNOW: MOV     FAC2(R5),-(SP)          ;(E,G,  A+B@ ) DONT DO THE + YET,
 2954  011440  020604                  CMP     SP,R4
 2955  011442  103410                  BLO     ERRPD5
 2956  011444  016546  000040          MOV     FAC1(R5),-(SP)
 2957  011450  010346                  MOV     R3,-(SP)
 2958  011452  005201                  INC     R1
 2959  011454  000167  177100          JMP     OPERAND
 2960  011460  000241          TERMIN: CLC                             ;CARRY OFF MEANS NUMERIC RESULT,
 2961  011462  000207                  RTS     PC
 2962  011464  000167  177430  ERRPD5: JMP     ERRPD%
 2963  011470  004767  005616  MINUS:  JSR     PC,SUBSTK
 2964  011474  005765  000040  UNARY:  TST     FAC1(R5)
 2965  011500  001404                  BEQ     UINTEG
 2966  011502  062765  100000  000040          ADD     #100000,FAC1(R5)
 2967  011510  000670                  BR      OPRATOR
 2968  011512  005465  000042  UINTEG: NEG     FAC2(R5)
 2969  011516  102265                  BVC     OPRATOR
 2970  011520  012765  044000  000040          MOV     #44000,FAC1(R5)
 2971  011526  005065  000042          CLR     FAC2(R5)
 2972  011532  000657                  BR      OPRATOR
 2973  011534  004767  175038  PLUS:   JSR     PC,ADDSTK
 2974  011540  000654                  BR      OPRATOR
 2975  011542  012767  011606  000000G STAR:   MOV     #ERSTAR,$ERVEC
 2976  011550  004467  001560          JSR     R4,FPPSAV
 2977  011554  011620                  ,WORD   TSTSTK                  ;TEST TOP OF STACK AND FLOAT IF INT
 2978  011556  011634                  ,WORD   PUSHF                   ;PUSH FAC AND FLOAT IF NEC
 2979  011560  000000G                 ,WORD   $MLR                    ;PERFORM MULT
 2980  011562  014270                  ,WORD   POP                     ;POP RESULT
 2981  011564  013306                  ,WORD   FPPRES
 2982  011566  000167  177500          STAR1:  JMP     OPRATOR
 2983  011572  012767  012230  000000G SLASH:  MOV     #ERRO]V,$ERVEC
 2984  011600  004467  001530          JSR     R4,FPPSAV
 2985  011604  011620                  ,WORD   TSTSTK
 2986  011606  011634                  ,WORD   PUSHF
 2987  011610  000000G                 ,WORD   $OVR
 2988  011612  014270                  ,WORD   POP
 2989  011614  013306                  ,WORD   FPPRES
 2990  011616  000763                  BR      STAR1
 2991  011620  005716          TSTSTK: TST     (SP)
 2992  011622  001003                  BNE     TSTS2
 2993  011624  005726          TSTS1:  TST     (SP)+
 2994  011626  000167  000000G         JMP     $IR
 2995  011632  000134          TSTS2:  JMP     @(R4)+                  ;RETURN
 2996  011634  016546  000042  PUSHF:  MOV     FAC2(R5),-(SP)
```



```
 2997  011640  016546  000040          MOV     FAC1(R5),-(SP)
 2998  011644  001767                  BEQ     TSTS1                   ;FLOAT IF INTEGER
 2999  011646  000134                  JMP     @(R4)+                  ;RETURN
 3000                                  ,IFDF   $NOSTR
 3001                          ;DUMMY ENTRY POINTS FOR $NOSTR
 3002                          SAVCHAR:
 3003                          ARGB:
 3004                          MAKEST:
 3005                          SOPRAT:
 3006                          STOSVAR:
 3007                          ERRMIX:
 3008                          STPRO:
 3009                                  ,ENDC
 3010
 3011                          ERRSYN:
 3012  011650  000004          ERRSX5: IOT
 3013                                  ,IFNDF  $LONGER
 3014  011652  054523     116          ,ASCII  'SYN'
 3015                                  ,ENDC
 3016                                  ,IFDF   $LONGER
 3017                                  ,ASCII  'SYNTAX ERROR'
 3018
 3019                                  ,ENDC
 3020  011655     000                  ,BYTE   0
 3021                                  ,EVEN
 3022
 3023                                  ,IFNDF  $NOSTR
 3024                          QUOTE:  CMPB    (R1)+,#,TEXT
 3025                                  BNE     ERRSX5
 3026                                  MOV     R2,R3                   ;SAVE QUOTE CHAR,
 3027                                  MOV     R1,R2
 3028                                  TSTB    (R1)+
 3029                                  BNE     .-2
 3030                                  CMP     SP,R4
 3031                                  BLO     ERRPD5
 3032                                  MOV     R2,-(SP)
 3033                                  SUB     #3,(SP)
 3034                                  MOV     R1,-(SP)
 3035                                  SUB     R2,(SP)
 3036                                  CMPB    (R1)+,R3                ;SAME AS STARTING QUOTE CHAR,?
 3037                                  BNE     ERRSX5
 3038                                  DEC     (SP)
 3039                                  BEQ     QUNULL
 3040                                  MOV     SP,R2
 3041                                  ADD     #2,R2
 3042                                  JSR     PC,MAKESTR
 3043                                  MOV     (SP)+,(SP)
 3044                                  JMP     QUOTBUM
 3045                          QUNULL: CMP     (SP)+,(SP)+
 3046                          GOTVAL: MOV     #-1,-(SP)
 3047                                  BR      SOPRATR
 3048                                  ,ENDC
 3049
 3050  011656  000167  000000          ERRD02: JMP     ERRD02
 3051
```

```
                                        .IFNDF  $NOSTR
                                STRGARR:JSR     PC,LOCGET
                                        BR      STRGBTH
                                STRGVAR:TST     (R2)+
                                        CMP     2(R2),#-1
                                        BEQ     STRGBTH
                                        MOV     (R2),R2
                                STRGBTH:MOV     (R2),R3
                                        CMP     R3,#-1
                                        BEQ     GOTVAL
                                        CMP     SP,R4
                                        BLO     ERRD02
                                        CLR     -(SP)
                                        MOVB    (R3),(SP)
                                        JSR     PC,MAKESTR
                                SOPRATR:CMPB    2(SP),#,AMPERS
                                        BEQ     CONCAT
                                        CMPB    (R1),#,AMPERS
                                        BEQ     AMPWAIT
                                        CMPB    2(SP),#,TERM
                                        BNE     ERRSX5
                                        MOV     (SP)+,R0
                                        TST     (SP)+
                                        MOV     (SP),R2
                                        MOV     R0,(SP)
                                        INC     R0
                                        BEQ     SOPRX           ;CHECK NULL STRING
                                        ADD     #2,R0
                                        MOV     SP,R3
                                        MOVB    R3,-(R0)
                                        SWAB    R3
                                        MOVB    R3,-(R0)
                                SOPRX:  SEC
                                        JMP     (R2)
                                AMPWAIT:MOVB    (R1)+,-(SP)
                                        JSR     PC,EVAL
                                        BCS     SOPRATR
                                ERRMIX: IOT
                                        .IFNDF  $LONGER
                                        .ASCII  \NSM\
                                        .ENDC
                                        .IFDF   $LONGER
                                        .ASCII  'NUMBERS AND STRINGS MIXED'
                                        .ENDC
                                        .BYTE 0
                                        .EVEN
                                CONCAT: CMP     (SP),#-1
                                        BNE     CATNOT
                                        CMP     (SP)+,(SP)+
                                        BR      SOPRATR
                                CATNOT: MOV     4(SP),R2
                                        CMP     R2,#-1
                                        BNE     CATLONG
                                        MOV     (SP)+,R0
                                        TST     (SP)+
```



```
                                        MOV     R0,(SP)
                                        BR      CATCOM
                                CATLONG:CLR     R0
                                        BISB    (R2),R0
                                        MOV     (SP),R3
                                        CMP     SP,R4
                                        BLO     ERRD02
                                        CLR     -(SP)
                                        MOVB    (R3),(SP)
                                        ADD     R0,(SP)
                                        CMP     (SP),#377
                                        BHI     ERRSTR
                                        MOV     SP,R2
                                        ADD     #6,R2
                                        JSR     PC,MAKESTR
                                        MOV     (SP)+,R3
                                        MOV     4(SP),R2
                                        CLR     R0
                                        BISB    (R2),R0
                                        MOV     R3,4(SP)
                                        ADD     R0,R3
                                        ADD     #3,R3
                                        MOV     (SP)+,R2
                                        TST     (SP)+
                                        CLR     R0
                                        BISB    (R2),R0
                                        ADD     #3,R2
                                        MOVB    (R2)+,(R3)+
                                        DEC     R0
                                        BGT     .-4
                                STPRO:
                                QUOTBUM:MOV     (SP),R0
                                CATCOM: MOV     SP,R2
                                        ADD     #3,R0
                                        MOVB    R2,-(R0)
                                        SWAB    R2
                                        MOVB    R2,-(R0)
                                        BR      SOPRATR
                                        .ENDC

                        011662  000167  177232  ERRD02: JMP     ERRDOL

                                        .IFNDF  $NOSTR
                                ERRSTR: IOT
                                        .IFNDF  $LONGER
                                        .ASCII  \STL\
                                        .ENDC
                                        .IFDF   $LONGER
                                        .ASCII  'STRING TOO LONG'
                                        .ENDC
                                        .BYTE 0
                                        .EVEN
                                        .ENDC

                                EREXP:
```

```
                                ERSTAR:
                                ERADD:
011666  000004                 ERROVR: IOT
                                        .IFNDF  $LONGER
011670  053117     106                  .ASCII  'OVF'
                                        .ENDC
                                        .IFDF   $LONGER
                                        .ASCII  'OVERFLOW'
                                        .ENDC
011673     000                  .BYTE 0
                                .EVEN

011674  012746  000000G         SINFN:  MOV     #SIN,-(SP)
011700  000432                         BR      FUNCTI
011702  012746  000000G         COSFN:  MOV     #COS,-(SP)
011706  000427                         BR      FUNCTI
011710  012746  000000G         SQRFN:  MOV     #SQRT,-(SP)
011714  012767  007734  000000G         MOV     #ERSQR,SERVEC
011722  000421                         BR      FUNCTI
011724  012746  000000G         ATNFN:  MOV     #ATAN,-(SP)
011730  000416                         BR      FUNCTI
011732  012746  0000000         EXPFN:  MOV     #EXP,-(SP)
011736  012767  011666  000000G         MOV     #EREXP,SERVEC
011744  000410                         BR      FUNCTI
011746  012746  000000G         LOGFN:  MOV     #ALOG,-(SP)
011752  012767  007734  000000G         MOV     #ERLOG,SERVEC
011760  000402                         BR      FUNCTI

                                        .IFNDF  $NOSTK
                                ERRMX9: JMP     ERRMIX
                                        .ENDC

011762  000167  177674          ERRD11: JMP     ERRD02
011766  004767  176624          FUNCTI: JSR     PC,EVAL

                                        .IFNDF  $NOSTK
                                        BCC     FUNCTJ
                                        JMP     ERRARG
                                FUNCTJ:
                                        .ENDC

011772  012603                         MOV     (SP)+,R3
011774  001002                         BNE     .+6
011776  000167  001014                 JMP     ERRUFN
012002  122127  000237                 CMPB    (R1)+,#,RPAR
012006  001045                         BNE     ERRSX9
012010  004467  001320                 JSR     R4,FPPSAV
012014  011634                         .WORD   PUSHF           ;PUSH FAC, FLOAT IF NECESSARY
012016  012024                         .WORD   FUNOK           ;GO DO FUNCTION
012020  013306                         .WORD   FPPRES
012022  000435                         BR      OPRFN
012024  010601          FUNOK:  MOV     SP,R1           ;SAVE ADDRESS OF PUSHED ARG
012026  010446                         MOV     R4,-(SP)        ;SAVE R4
012030  012746  012056                 MOV     #FUNRET,-(SP)   ;DUMMY RETURN ADDRESS
012034  012746  000137                 MOV     #137,-(SP)      ;DUMMY JUMP INSTR,
```



```
012040  010146                         MOV     R1,-(SP)        ;ADDR OF ARGUMENT
012042  012746  000401                 MOV     #401,-(SP)      ;DUMMY BW
012046  010500                         MOV     R5,R0           ;SAVE R5 VALUE
012050  010605                         MOV     SP,R5           ;RETURN ADDRESS (TO DUMMY PROG IN STK)
012052  004070  000052                 JSR     R0,@R5SAVE(R0)
012056  062706  000010          FUNRET: ADD     #8.,SP          ;POP DUMMY PROGRAM
012062  012604                         MOV     (SP)+,R4        ;RESTORE R4
012064  022626                         CMP     (SP)+,(SP)+     ;REMOVE OLD FAC FROM STACK
012066  010065  000040                 MOV     R0,FAC1(R5)     ;STORE RESULT IN FAC
012072  010165  000042                 MOV     R1,FAC2(R5)
012076  000134                         JMP     @(R4)+          ;AND RETURN

                                        .IFNDF  $NOSTK
                                ERRMX8: JMP     ERRMIX
                                        .ENDC

012100  004767  176512          INTFN:  JSR     PC,EVAL

                                        .IFNDF  $NOSTK
                                        BCS     ERRMX8
                                        .ENDC

012104  122127  000237                 CMPB    (R1)+,#,RPAR
012110  001034                         BNE     ERRSX9
012112  004767  001666                 JSR     PC,INT
012116  000167  177150          OPRFN:  JMP     OPRATOR
012122  000167  177522          ERRSX9: JMP     ERRSXD


                                ;       IF A IS NOT 0,FLOAT IT
012126  005716                 UPARRO: TST     (SP)            ;IS UPPER A 0
012130  001010                         BNE     UA1
012132  005766  000002                 TST     2(SP)           ;IS LOWER A 0
012136  001405                         BEQ     UA1
012140  005726                         TST     (SP)+
012142  004467  001166                 JSR     R4,FPPSAV
012146  000000G                        .WORD   SIR
012150  013306                         .WORD   FPPRES

012152  012767  012516  000000G UA1:    MOV     #ERREXP,SERVEC
012160  005765  000040                 TST     FAC1(R5)        ;IS UPPER B = 0
012164  001036                         BNE     UA10
012166  005765  000042                 TST     FAC2(R5)        ;IS LOWER B = 0
012172  001036                         BNE     UA5
012174  012765  000001  000042         MOV     #1,FAC2(R5)     ;SET RESULT 1
012202  022626                 UA4:    CMP     (SP)+,(SP)+
012204  000167  177002                 JMP     OPRATOR

                                ; B IS INTEGER
012210  005716                 UA5:    TST     (SP)            ;IS A = 0
012212  001077                         BNE     UA17
012214  005765  000042                 TST     FAC2(R5)        ;IS LOWER B > 0
012220  100013                         BPL     UA9             ;NO, ERROR MESSAGE
012222  000004                 UA8:    IOT
                                        .IFNDF  $LONGER
```

```
 3272  012224  053104     060                    ;ASCII  'DV0'
 3273                                            ;ENDC
 3274                                            ;IFDF   $LONGER
 3275                                            ;ASCII  'DIVISION BY 0'
 3276                                            ;ENDC
 3277  012227     000                             ;BYTE   0
 3278                                            ;EVEN
 3279  012230  020027  004000          ERRDIV: CMP     R0,#4000
 3280  012234  103372                          BHIS    UA8
 3281  012236  000167  177424                  JMP     ERSTAR
 3282  012242  103367                          BHIS    UA8             ;DIV BY 0
 3283  012244  000167  177416                  JMP     ERROVR          ;OVERFLOW
 3284  012250  005065  000040          UA9:    CLR     FAC1(R5)        ;SET RESULT 0
 3285  012254  005065  000042                  CLR     FAC2(R5)
 3286  012260  000750                          BR      UA4
 3287
 3288                                    ;FIX B IF INTEGER < 256
 3289  012262  005765  000042          UA10:   TST     FAC2(R5)
 3290  012266  001036                          BNE     UA10,5
 3291  012270  016500  000040                  MOV     FAC1(R5),R0
 3292  012274  010002                          MOV     R0,R2
 3293  012276  042700  100177                  BIC     #100177,R0      ;EXTRACT EXPONENT
 3294  012302  020027  040200                  CMP     R0,#40200       ;CHECK TOO SMALL
 3295  012306  103426                          BLO     UA10,5
 3296  012310  042702  177600                  BIC     #177600,R2
 3297  012314  052702  000200                  BIS     #200,R2         ;R2 IS MANTISSA
 3298  012320  020027  042000          UA10A:  CMP     R0,#42000
 3299  012324  001406                          BEQ     UA10B
 3300  012326  101016                          BHI     UA10,5
 3301  012330  006202                          ASR     R2
 3302  012332  103414                          BCS     UA10,5          ;IF BIT CLEARED,NO GOOD
 3303  012334  062700  000200                  ADD     #200,R0         ;UPDATE EXPONENT
 3304  012340  000767                          BR      UA10A
 3305  012342  005765  000040          UA10B:  TST     FAC1(R5)
 3306  012346  100001                          BPL     UA10C
 3307  012350  005402                          NEG     R2
 3308  012352  005065  000040          UA10C:  CLR     FAC1(R5)
 3309  012356  010265  000042                  MOV     R2,FAC2(R5)
 3310  012362  000712                          BR      UA5
 3311                                    ;B IS REAL
 3312  012364  005716                  UA10,5: TST     (SP)            ;IS A = 0
 3313  012366  001405                          BEQ     UA12
 3314  012370  004467  000740                  JSR     R4,FPPSAV
 3315  012374  014256                          ,WORD   PUSH
 3316  012376  012536  012600                  ,WORD   UAJMP,UA23
 3317
 3318  012402  005765  000040          UA12:   TST     FAC1(R5)        ;IS UPPER B> 0
 3319  012406  100320                          BPL     UA9             ;YES
 3320  012410  000704                          BR      UA8             ;NO, ERROR
 3321
 3322                                    ;B INTEGER, A REAL
 3323  012412  016500  000042          UA17:   MOV     FAC2(R5),R0
 3324  012416  010002                          MOV     R0,R2           ;SAVE FOR SIGN TEST
 3325  012420  002001                          BGE     UA17A
 3326  012422  005400                          NEG     R0
```



```
 3327  012424  020027  000256          UA17A:  CMP     R0,#256         ;R0 IS ABS(B) IF TOO BIG, FLOAT
 3328  012430  103057                          BHIS    UA20
 3329  012432  004467  000670                  JSR     R4,FPPSAV       ;GO INTO POLISH MODE
 3330  012436  014270                          ,WORD   POP             ;CURRENT PRODUCT IS A
 3331  012440  014302                          ,WORD   PUSH1           ;CURRENT ANSWER IS 1 (ON STK)
 3332  012442  012524  012452          UA17B:  ,WORD   UAASR,UA17D     ;SHIFT B, BRANCH IF BIT IS 0
 3333  012446  014256                          ,WORD   PUSH            ;GET CURRENT PRODUCT ONT OSTACK
 3334  012450  000000G                         ,WORD   $MLR            ;MULTIPLY INTO CURRENT ANSWER
 3335  012452  012542  012472          UA17D:  ,WORD   UATST0,UA17F    ;TEST IF DONE, BRANCH IF SO
 3336  012456  014256  014256                  ,WORD   PUSH,PUSH       ;TWO COPIES OF CURRENT PRODUCT
 3337  012462  000000G                         ,WORD   $MLR            ;SQUARE IT
 3338  012464  014270                          ,WORD   POP             ;AND PUT RESULT BACK
 3339  012466  012536  012442                  ,WORD   UAJMP,UA17B     ;POLISH JUMP TO 17B
 3340  012472  014270                  UA17F:  ,WORD   POP             ;STORE ANSWER INTO FAC
 3341  012474  012552  012510                  ,WORD   UATST2,UA19     ;TEST SIGN B, IF + JUMP
 3342  012500  014302                          ,WORD   PUSH1           ;PUSH 1 ONTO STACK
 3343  012502  014256                          ,WORD   PUSH
 3344  012504  000000G                         ,WORD   $DVR            ;ANS = 1/ANS IF B NEG
 3345  012506  014270                          ,WORD   POP     ;POP ANSWER TO FAC
 3346  012510  013306                  UA19:   ,WORD   FPPRES
 3347  012512  000167  176554                  JMP     OPRATOR         ;AND GET OUT
 3348
 3349                                    ERREXP:
 3350  012516  000004                  UA21:   IOT
 3351                                            ;IFNDF  $LONGER
 3352  012520  042536     122                  ;ASCII  \?ER\
 3353                                            ;ENDC
 3354                                            ;IFDF   $LONGER
 3355                                            ;ASCII  /? ERROR/
 3356                                            ;ENDC
 3357  012523     000                             ;BYTE   0
 3358                                            ;EVEN
 3359
 3360  012524  006265  000044          UAASR:  ASR     R0SAVE(R5)
 3361  012530  103002                          BCC     UAJMP
 3362  012532  005724                  UANJMP: TST     (R4)+           ;SKIP OVER JUMP ADDRESS
 3363  012534  000134                          JMP     @(R4)+
 3364  012536  011404                  UAJMP:  MOV     @R4,R4          ;POLISH MODE JUMP
 3365  012540  000134                          JMP     @(R4)+
 3366  012542  005765  000044          UATST0: TST     R0SAVE  (R5)
 3367  012546  001773                          BEQ     UAJMP
 3368  012550  000770                          BR      UANJMP
 3369  012552  005765  000050          UATST2: TST     R2SAVE(R5)      ;TEST SIGN OF B
 3370  012556  100367                          BPL     UAJMP           ;POLISH JUMP IF B +
 3371  012560  000764                          BR      UANJMP
 3372  012562  005716                  UATSTA: TST     @SP
 3373  012564  100754                          BMI     UA21
 3374  012566  000134                          JMP     @(R4)+
 3375
 3376  012570  010246                  UA20:   MOV     R2,-(SP)        ;PUSH INT B ON STACK
 3377  012572  004467  000536                  JSR     R4,FPPSAV
 3378  012576  000000G                         ,WORD   $IR             ;FLOAT B
 3379                                    UA23:
 3380  012600  012622                          ,WORD   REVRSE          ;REVERSE TOP TWO ON STK
 3381  012602  012562                          ,WORD   UATSTA          ;TEST TOP STK, BR TO ERR IF -
```

```
 3382  012604  012644                          .WORD   CALOG           ;CALL ALOG FUNCTION ON A, RESULT TO FAC
 3383  012606  014256                          .WORD   PUSH            ;PUSH LOG(A) ONTO STACK
 3384  012610  000000G                         .WORD   $MLR            ;CALC B*LOG(A)
 3385  012612  012656                          .WORD   CEXP            ;CALC EXP(B*LOG(A)), RESULT TO FAC
 3386  012614  013306                          .WORD   FPPRES
 3387  012616  000167  176450                  JMP     OPRATOR
 3388  012622  012600                  REVRSE: MOV     (SP)+,R0        ;ROUTINE TO REVERSE TOP 2
 3389  012624  012601                          MOV     (SP)+,R1        ;FLTPT NUMBERS ON STACK
 3390  012626  012602                          MOV     (SP)+,R2
 3391  012630  012603                          MOV     (SP)+,R3
 3392  012632  010146                          MOV     R1,-(SP)
 3393  012634  010046                          MOV     R0,-(SP)
 3394  012636  010346                          MOV     R3,-(SP)
 3395  012640  010246                          MOV     R2,-(SP)
 3396  012642  000134                          JMP     @(R4)+
 3397  012644  012765  000000G 000052  CALOG:  MOV     #ALOG,R3SAVE(R5)
 3398  012652  000167  177146                  JMP     FUNOK
 3399  012656  012765  000000G 000052  CEXP:   MOV     #EXP,R3SAVE(R5)
 3400  012664  000167  177134                  JMP     FUNOK
 3401  012670  000167  176224          ERRPD4: JMP     ERRPDL
 3402
 3403                                          .IFNDF  $NOSTR
 3404                                  ERRMX1: JMP     ERRMIX
 3405                                          .ENDC
 3406
 3407  012674  000167  176750          ERRSXA: JMP     ERRSXP
 3408  012700  112102                  FNFN:   MOVB    (R1)+,R2
 3409  012702  122127  000255                  CMPB    (R1)+,#,LPAR
 3410  012706  001372                          BNE     ERRSXA
 3411  012710  066502  000004                  ADD     PDL(R5),R2
 3412  012714  020604                          CMP     SP,R4
 3413  012716  103764                          BLO     ERRPD4
 3414  012720  011200                          MOV     (R2),R0         ;R0 NOW CONTAINS THE DEF POINTER,
 3415  012722  001435                          BEQ     ERRUFN
 3416  012724  010046                  FNSWAP: MOV     R0,-(SP)
 3417  012726  004767  175664                  JSR     PC,EVAL
 3418
 3419                                          .IFNDF  $NOSTR
 3420                                          BCS     FNSTR
 3421                                          .ENDC
 3422
 3423  012732  012600                          MOV     (SP)+,R0                ;RESTORE THE DEF POINTER,
 3424  012734  112002                          MOVB    (R0)+,R2                ;GET THE VARIABLE FROM THE DEF,
 3425  012736  100425                          BMI     ERRAG1
 3426  012740  000302                          SWAB    R2
 3427  012742  152002                          BISB    (R0)+,R2
 3428  012744  061502                          ADD     (R5),R2
 3429
 3430                                          .IFNDF  $NOSTR
 3431                                          CMP     (R2),#,SVAR     ;IF THE DEF VARIABLE IS STRING AND
 3432                                          BEQ     ERRMX1          ;THE VALUE ISNT THEN ITS AN ERROR,
 3433                                          .ENDC
 3434
 3435  012746  022227  177775                  CMP     (R2)+,#,SCALAR
 3436  012752  001401                          BEQ     .+4
```



```
 3437  012754  011202                          MOV     (R2),R2
 3438  012756  020604                          CMP     SP,R4
 3439  012760  103743                          BLO     ERRPD4
 3440  012762  011246                          MOV     (R2),-(SP)      ;STACK THE OLD VALUE AND REPLACE IT
 3441  012764  016522  000040                  MOV     FAC1(R5),(R2)+  ;WITH THE NEW VALUE
 3442  012770  011246                          MOV     (R2),-(SP)
 3443  012772  016512  000042                  MOV     FAC2(R5),(R2)
 3444  012776  000400                          BR      FNREPL
 3445
 3446                                          .IFNDF  $NOSTR
 3447                                  FNSTR:  MOV     2(SP),R0                ;RESTORE THE DEF POINTER,
 3448                                          MOVB    (R0)+,R2                ;GET THE VARIABLE FROM THE DEF,
 3449                                          BMI     ERRAG1
 3450                                          SWAB    R2
 3451                                          BISB    (R0)+,R2
 3452                                          ADD     (R5),R2
 3453                                          CMP     (R2)+,#,SVAR    ;IF THE DEF VARIABLE IS NUMERIC AND
 3454                                          BNE     ERRMX1          ;THE VALUE ISNT THEN ITS AN ERROR,
 3455                                          CMP     2(R2),#-1       ;IF THE VAR ISNT A STRING SCALAR
 3456                                          BEQ     .+4
 3457                                          MOV     (R2),R2         ;THEN DO THIS,
 3458                                          MOV     (R2),R3         ;R3 NOW CONTAINS THE OLD VALUE,
 3459                                          MOV     (SP)+,(R2)      ;@(R2) NOW CONTAINS THE NEW VALUE,
 3460                                          MOV     R3,(SP)         ;@(SP) NOW CONTAINS THE OLD VALUE,
 3461                                          MOV     R2,-(SP)                ;TOP(STK) IS A TEMP FOR VAR ADDRESS,
 3462                                          MOV     (R2),R2         ;R2 NOW CONTAINS THE NEW VALUE,
 3463                                          INC     R2
 3464                                          BEQ     FNNEWNL         ;BRANCH IF THE NEW VALUE IS NULL,
 3465                                          INC     R3
 3466                                          BNE     FNOLNN          ;BRANCH IF THE OLD VALUE IS NONNULL,
 3467                                          MOVB    1(SP),(R2)+     ;OLD VALUE IS NULL, NEW IS NOT; SO:
 3468                                          MOVB    (SP)+,(R2)      ;MAKE AN ABS BACKPTR TO THE VAR,
 3469                                          BR      FNREPL          ;(THE NEW VALUE IS NOW PROTECTED)
 3470                                  FNOLNN: MOVB    (R3)+,(R2)+     ;OLD AND NEW ARE BOTH NONNULL SO:
 3471                                          MOVB    (R3),(R2)       ;PUT OLD BACKPTR INTO THE NEW VALUE,
 3472                                          SUB     #2,R3
 3473                                  FNNEWNL:TST     (SP)+           ;GET RID OF THE TEMP,
 3474                                          MOV     SP,R2
 3475                                          INC     R3
 3476                                          BEQ     FNREPL          ;    (CHECK NULL STRING!)
 3477                                          SWAB    R2              ;SET THE BACKPTR OF THE OLD VALUE
 3478                                          MOVB    R2,(R3)+        ;TO ITS CURRENT STACK ADDRESS,
 3479                                          SWAB    R2
 3480                                          MOVB    R2,(R3)
 3481                                          .ENDC
 3482
 3483  013000  121027  000243          FNREPL: CMPB    (R0),#,COMMA
 3484  013004  001007                          BNE     FNNOCOM
 3485  013006  122021                          CMPB    (R0)+,(R1)+
 3486  013010  001745                          BEQ     FNSWAP
 3487  013012  000167  174716          ERRAG1: JMP     ERRARG
 3488  013016  000004                  ERRUFN: IOT
 3489                                          .IFNDF  $LONGER
 3490  013020  043125      116                 .ASCII  'UFN'
 3491                                          .ENDC
```

```
3492                                    ,IFDF   $LONGER
3493                                    ,ASCII  'UNDEFINED FUNCTION'
3494                                    ,ENDC
3495  013023     000                    ,BYTE 0
3496                                    ,EVEN
3497  013024  121027  000237  FNNOCOM:  CMPB    (R0)+,#,RPAR
3498  013030  001370            BNE     ERRAG1
3499  013032  010046            MOV     R0,-(SP)
3500  013034  122021            CMPB    (R0)+,(R1)+
3501  013036  001365            BNE     ERRAG1
3502  013040  122027  000254    CMPB    (R0)+,#,EQ
3503  013044  001362            BNE     ERRAG1
3504  013046  010146            MOV     R1,-(SP)
3505  013050  010001            MOV     R0,R1
3506  013052  004767  175540    JSR     PC,EVAL
3507  013056  103402            BCS     .+6
3508  013060  005003            CLR     R3
3509  013062  000401            BR      .+4
3510  013064  012603            MOV     (SP)+,R3
3511  013066  121127  000201    CMPB    (R1),#,EOL
3512  013072  001300            BNE     ERRSXA
3513  013074  012601            MOV     (SP)+,R1
3514  013076  012600            MOV     (SP)+,R0
3515  013100  114046  FNRLUP:   MOVB    -(R0),-(SP)
3516  013102  114066  000001    MOVB    -(R0),1(SP)
3517  013106  012602            MOV     (SP)+,R2
3518  013110  061502            ADD     (R5),R2
3519
3520                                    ,IFNDF  $NOSTR
3521                                    CMP     (R2),#,SVAR
3522                                    BEQ     FNRSTR
3523                                    ,ENDC
3524
3525  013112  022227  177775            CMP     (R2)+,#,SCALAR
3526  013116  001401                    BEQ     .+4
3527  013120  011202                    MOV     (R2),R2
3528  013122  012662  000002            MOV     (SP)+,2(R2)
3529  013126  012612                    MOV     (SP)+,(R2)
3530  013130  000414                    BR      FNCHK
3531  013132  012612  FNRSSC:  MOV     (SP)+,(R2)
3532  013134  010046            MOV     R0,-(SP)
3533  013136  011200            MOV     (R2),R0
3534  013140  161502            SUB     (R5),R2
3535  013142  005202            INC     R2
3536
3537                                    ,IFNDF  $NOSTR
3538                                    BR      FNRCOM
3539                                FNRSTR: TST     (R2)+
3540                                    CMP     2(R2),#-1
3541                                    BEQ     FNRSSC
3542                                    MOV     (R2),R2
3543                                    MOV     (SP)+,(R2)
3544                                    MOV     R0,-(SP)
3545                                    MOV     (R2),R0
3546                                    ,ENDC
```



```
3547
3548  013144  005200  FNRCOM: INC     R0
3549  013146  001404            BEQ     FNRSNUL
3550  013150  000302            SWAB    R2
3551  013152  110220            MOVB    R2,(R0)+
3552  013154  000302            SWAB    R2
3553  013156  110220            MOVB    R2,(R0)+
3554  013160  012600  FNRSNUL:MOV     (SP)+,R0
3555  013162  124027  000255  FNCHK:  CMPB    -(R0),#,LPAR
3556  013166  001344            BNE     FNRLUP
3557
3558                                    ,IFNDF  $NOSTR
3559                                    TST     R3
3560                                    BEQ     FNNUMER
3561                                    MOV     R3,-(SP)
3562                                    CMP     R3,#177777      ;CHECK NULL STRING
3563                                    BNE     .+6
3564                                    JMP     $OPRATR
3565                                    JMP     $TPRO
3566                                    ,ENDC
3567
3568  013170  000167  176076  FNNUMER:JMP     OPRATOR
3569                                    ,EOT
3570
```

```
                                        ;                                       SOURCE FILE #6
                                        ;+--------------------------------------------------------
                                        ; SUBROUTINE 'FIXUP'    CALLED BY JSR PC
                                        ;                       MATCHES TYPES OF @(SP),2(SP) AND FAC1(R5),FAC2(R5)
                                        ;                       R0,R1  UNUSED
                                        ;                       R2  DESTROYED
                                        ;                       R3,R4  UNUSED
                                        ;                       R5  MUST POINT TO USER AREA
                                        ;                       SP  GOES NO DEEPER AFTER JSR
013174  012602                  FIXUP:  MOV     (SP)+,R2
013176  005716                          TST     (SP)
013200  001413                          BEQ     FIXTST
013202  005765  000040                  TST     FAC1(R5)
013206  001021                          BNE     FIXRET          ;COND CODES=NONZERO MEANS FLOATING,
013210  016546  000042                  MOV     FAC2(R5),-(SP)          ;****
013214  004467  000114                  JSR     R4,FPPSAV
013220  000000G                         .WORD   SIR
013222  014270                          .WORD   POP
013224  013306                          .WORD   FPPRES
013226  000410                          BR      FIXCLZ
013230  005765  000040          FIXTST: TST     FAC1(R5)
013234  001406                          BEQ     FIXRET          ;COND CODES=0 MEANS INTEGER,
013236  005726                          TST     (SP)+                   ;****
013240  004467  000070                  JSR     R4,FPPSAV
013244  000000G                         .WORD   SIR
013246  013306                          .WORD   FPPRES
013250  000244                  FIXCLZ: CLZ                     ;COND CODES=NONZERO MEANS FLOATING,
013252  000112                  FIXRET: JMP     (R2)
```



```
                                        ;+--------------------------------------------------------
                                        ; SUBROUTINE 'FLINE'    CALLED BY JSR PC
                                        ;                       FINDS THE ADDRESS OF THE LINE NO
                                        ;                       REFERENCED BY (R1) IN R2,
                                        ;                       IF THE SYMBOL TABLE REFERENCE IS NOT A LINE NO,
                                        ;                       SETS CARRY, OTHERWISE, THE CARRY IS CLEAR,
013254  112102                  FLINE:  MOVB    (R1)+,R2
013256  100407                          BMI     FLE
013260  000302                          SWAB    R2
013262  152102                          BISB    (R1)+,R2
013264  061502                          ADD     (R5),R2
013266  012200                          MOV     (R2)+,R0
013270  020027  177775                  CMP     R0,#,SCALAR
013274  103402                          BLO     FLX
013276  000261                  FLE:    SEC
013300  000207                          RTS     PC
013302  000241                  FLX:    CLC
013304  000207                          RTS     PC
```

```
3619                                    ;+-----------------------------------------------------------
3620                                    ; ROUTINE 'FPPRES'      CALLED IN POLISH MODE
3621                                    ;                       RESTORES R0 THRU R4 SAVED BY FPPSAV
3622                                    ;                       AND RETURNS IN NORMAL EXEC MODE
3623  013306  016500  000044           FPPRES: MOV     R0SAVE(R5),R0
3624  013312  016501  000046                   MOV     R1SAVE(R5),R1
3625  013316  016502  000050                   MOV     R2SAVE(R5),R2
3626  013322  016503  000052                   MOV     R3SAVE(R5),R3
3627  013326  016546  000054                   MOV     R4SAVE(R5),-(SP)
3628  013332  000204                           RTS     R4
3629
3630
3631                                    ;+-----------------------------------------------------------
3632                                    ; ROUTINE 'FPPSAV'      CALLED BY JSR R4
3633                                    ;                       SAVES R0 THRU R4, AND RETURNS IN
3634                                    ;                       POLISH MODE
3635  013334  010065  000044           FPPSAV: MOV     R0,R0SAVE(R5)
3636  013340  010165  000046                   MOV     R1,R1SAVE(R5)
3637  013344  010265  000050                   MOV     R2,R2SAVE(R5)
3638  013350  010365  000052                   MOV     R3,R3SAVE(R5)
3639  013354  012665  000054                   MOV     (SP)+,R4SAVE(R5)
3640  013360  000134                           JMP     @(R4)+          ;ENTER POLISH MODE
3641
```



```
3642                                    ;
3643                                    ; GET1BYT (GET2BYT) - GET BYTE OUT OF RING BUFFER USING
3644                                    ;  GET POINTER 1 (R2),
3645                                    ;
3646                                    ; CALL: #[BUFF, HDR, BASE],R1
3647                                    ;       #[BASE OFFSET OF GET PTR],R2
3648                                    ;       JSR     PC,GET1BYT
3649                                    ;
3650                                    ;  USES R0,R1,R2,R3
3651                                    ;
3652                                    ;  RETURN CHAR, IN R0,
3653                                    ;  'C' BIT IS: CLR IF CHAR' OBTAINED
3654                                    ;            SET IF BUFF' WAS EMPTY (NO CHAR,)
3655                                    ;
3656  013362  012703  000004           GET1BYT:MOV     #BGET1,R3
3657  013366  000402                           BR      GETBYT
3658  013370  012703  000006           GET2BYT:MOV     #BGET2,R3
3659  013374  012702  177776           GETBYT: MOV     #PS,R2          ;STATUS
3660  013400  011246                           MOV     (R2),-(SP)
3661  013402  012712  000340                   MOV     #PR7,(R2)       ;HIGHEST PRIORITY
3662  013406  060103                           ADD     R1,R3
3663  013410  021361  000010                   CMP     (R3),BPUT(R1)   ;ANYTHING IN BUFF?
3664  013414  001412                           BEQ     BUFEMP
3665  013416  113300                           MOVB    @(R3)+,R0       ;GET BYTE
3666  013420  005243                           INC     -(R3)           ;PT, TO NEXT BYTE
3667  013422  021361  000002                   CMP     (R3),BEND(R1)   ;WRAP AROUND?
3668  013426  101402                           BLOS    NOWRP
3669  013430  016113  000000                   MOV     BSTRT(R1),(R3)  ;PT, TO NEXT BYTE TO GET
3670  013434  012612           NOWRP:  MOV     (SP)+,(R2)      ;STATUS BACK
3671  013436  000241                           CLC                     ;SIGNAL SUCCESS
3672  013440  000207                           RTS     PC
3673  013442  012612           BUFEMP: MOV     (SP)+,(R2)      ;STATUS BACK
3674  013444  000261                           SEC                     ;SHOW FAILURE
3675  013446  000207                           RTS     PC
3676
```

```
                                        ;+-----------------------------------------------------------
                                        ;
                                        ; GETCHAR - RETURN A CHAR, IN R0 OR WAIT UNTIL YOU CAN
                                        ;
                                        ; CALL: #[BUFF, WDR, BASE],R1
                                        ;       JSR     PC,GETCHAR
                                        ;
                                        ;  USES R3, (R0,R1,R2)
                                        ;
                                        ;  RETURNS CHAR, IN R0
                                        ;  IF PAPER TAPE READER EOT FOUND, EXIT TO 'READY',
                                        ;
013450  010246                  GETCHAR: MOV     R2,-(SP)
013452  004767  177704          GETCH1: JSR     PC,GET1BYT
                                        BCS     NOCHAR          ;NOTHING THERE YET
013456  103405                          MOV     BFSPEC(R1),R2   ;CHECK IF READER STOPPED
013460  016102  000012                  BGT     XCHAR           ;IF 0> - IS OK, BRANCH IF CHAR
013464  003011                  GETX:   MOV     (SP)+,R2
013466  012602                          RTS     PC
013470  000207
013472  016100  000012          NOCHAR: MOV     BFSPEC(R1),R0   ;CHECK EOF OR EXTRA CHAR
013476  001423                          BEQ     REENAB
013500  005061  000012                  CLR     BFSPEC(R1)
013504  000261                          SEC
013506  000767                          BR      GETX
013510  010046                  XCHAR:  MOV     R0,-(SP)        ;PUSH OLD CHAR
013512  010200                          MOV     R2,R0           ;POSITION NEXT
013514  004767  003864                  JSR     PC,PUT1BYT
013520  103001                          BCC     .+4             ;MAKE SURE IT GOT IN!
013522  000000                          HALT
013524  012600                          MOV     (SP)+,R0        ;GET BACK OLD CHAR
013526  005061  000012                  CLR     BFSPEC(R1)
013532  116502  000077                  MOVB    IDEV(R5),R2
013536  012772  000101  013600          MOV     #101,@ITAB(R2)  ;RE-ENABLE INPUT DEVICE
013544  000750                          BR      GETX            ; (CARRY IS CLEAR)
                                        ;       RE-ENABLE FROM A DEAD START
013546  116502  000077          REENAB: MOVB    IDEV(R5),R2
013552  032772  004000  013600          BIT     #004000,@ITAB(R2)       ;CHECK BUSY BIT
013560  001003                          BNE     GCWAIT
013562  012772  000101  013600          MOV     #101,@ITAB(R2)
013570  000001                  GCWAIT: WAIT                    ;WAIT FOR AN INTERRUPT
013572  004767  000514                  JSR     PC,IOWAIT       ;WASTE TIME
013576  000725                          BR      GETCH1

                                        ;       TABLE OF INPUT DEVICE STATUS REGISTERS
013600  177560                  ITAB:   .WORD   TKS
013602  177550                          .WORD   PRS
```



```
                                        ;+-----------------------------------------------------------
                                        ; 'GETVAR' SUBROUTINE
                                        ;               THIS SUBROUTINE READS A VARIABLE NAME OR
                                        ;               AN ARRAY ELEMENT, AND ADDRESSES THAT
                                        ;               VARIABLE IN CORE, SO THAT A SUBSEQUENT 'STOVAR'
                                        ;               CALL WILL STORE THE FAC IN THE VARIABLE,
                                        ;               DESTROYS FAC1 AND FAC2,
                                        ;               CALLED BY JSR PC,GETVAR
                                        ;                       R1 POINTS TO THE CODE NAMING THE VARIABLE
                                        ;
013604  010265  000022          GETVAR: MOV     R2,VARSAV(R5)
013610  012722  177777                  MOV     #-1,R2
013614  010265  000024                  MOV     R2,SS1SAV(R5)
013620  010265  000026                  MOV     R2,SS2SAV(R5)
013624  121127  000255                  CMPB    (R1),#'(
013630  001041                          BNE     NOSUBS
013632  005201                          INC     R1
013634  004767  174756                  JSR     PC,EVAL

                                        .IFNDF  $NOSTK
                                        BCS     ERRMX3
                                        .ENDC

013640  004767  000140                  JSR     PC,INT
013644  005765  000040                  TST     FAC1(R5)
013650  001034                          BNE     ERRSS1
013652  016565  000042  000024          MOV     FAC2(R5),SS1SAV(R5)
013660  100430                          BMI     ERRSS1
013662  112102                          MOVB    (R1)+,R2
013664  120227  000237                  CMPB    R2,#')
013670  001421                          BEQ     NOSUBS
013672  120227  000243                  CMPB    R2,#',
013676  001017                          BNE     ERRSX3
013700  004767  174712                  JSR     PC,EVAL

                                        .IFNDF  $NOSTK
                                        BCS     ERRMX3
                                        .ENDC

013704  004767  000074                  JSR     PC,INT
013710  005765  000040                  TST     FAC1(R5)
013714  001012                          BNE     ERRSS1
013716  016565  000042  000026          MOV     FAC2(R5),SS2SAV(R5)
013724  100406                          BMI     ERRSS1
013726  122127  000237                  CMPB    (R1)+,#')
013732  001001                          BNE     ERRSX3
013734  000207                  NOSUBS: RTS     PC
013736  000167  175706          ERRSX3: JMP     ERRSXD

                                        .IFNDF  $NOSTK
                                ERRMX3: JMP     ERRMIX
                                        .ENDC

013742  000167  175206          ERRSS1: JMP     ERRSS2
```

```
                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;
                                ; INITBF - INIT, BUFFER WORD,
                                ;
                                ; CALL: MOV     #[WDR, ADDR,],R2
                                ;       JSR     PC,INITBF
                                ;
                                ;  USES R2,R3
                                ;
                                ;  LEAVES R3 POINTING TO WORD AFTER LAST IN BUFF, WDR,
                                ;
013746  012203                  INITBF: MOV     (R2)+,R3        ;BUFF, START ADDR,
013750  005722                          TST     (R2)+           ;PT, TO BGET1
013752  010322                          MOV     R3,(R2)+
013754  005722                          TST     (R2)+           ;PT, TO BPUT
013756  010322                          MOV     R3,(R2)+
013760  005022                          CLR     (R2)+           ;BFSPEC
013762  000207                          RTS     PC
                                ;
                                ;
                                ;
                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;
                                ; INITSCR - SCRATCH USER AREA
                                ;
                                ; CALL: JSR     PC,INITSCR
                                ;
                                ;  USES R0
                                ;
013764  016500  000016          INITSCR:MOV     CODE(R5),R0
013770  012720  000225                  MOV     #,EOF,(R0)+
013774  010015                          MOV     R0,(R5)
013776  010065  000014                  MOV     R0,LOFREE(R5)
014002  000207                          RTS     PC
```



```
                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;  SUBROUTINE FINT:     CALLED BY JSR PC
                                ;                       COMPUTES INT(FAC), CONVERTING THE RESULT
                                ;                       TO A 1-WORD INTEGER, IF POSSIBLE
014004  016500  000040          INT:    MOV     FAC1(R5),R0     ;GET HIGH ORDER WORD IN R0
014010  001452                          BEQ     INTRTS          ;ALREADY AN INTEGER
014012  004567  003044                  JSR     R5,SAVREG       ;SAVE REGISTERS
014016  010001                          MOV     R0,R1
014020  042700  100177                  BIC     #100177,R0      ;EXTRACT EXPONENT
014024  020027  040200                  CMP     R0,#40200       ;CHECK ABS VALUE < 1
014030  103473                          BLO     INT7
014032  020027  046000                  CMP     R0,#46000       ;CHECK INTEGER BY TRUNCATION
014036  101037                          BHI     INTRTS          ;YES, RETURN
014040  005002                          CLR     R2
014042  162700  043600                  SUB     #43600,R0       ;CHECK MORE THAN 15 BITS INTEGER
014046  003034                          BGT     INT5            ;YES, PRODUCE FLT INT ANSWER
014050  000301                          SWAB    R1
014052  105001                          CLRB    R1
014054  156501  000043                  BISB    FAC2+1(R5),R1   ;R1 IS 16 BITS OF MANTISSA
014060  052701  100000                  BIS     #100000,R1      ;SET HIDDEN BIT
014064  000241                          CLC
014066  006001                          ROR     R1              ;GET 15 BITS OF ABSOLUTE VALUE
014070  005700                          TST     R0              ;TEST ALREADY INTEGER
014072  002005                          BGE     INT1A           ;YES
014074  006201                  INT1:   ASR     R1              ;SHIFT MANTISSA 1 RIGHT
014076  005502                          ADC     R2              ;ADD CARRY BIT TO R2
014100  062700  000200                  ADD     #200,R0         ;INCREMENT EXPONENT
014104  002773                          BLT     INT1            ;LOOP UNTIL DONE
014106  005765  000040          INT1A:  TST     FAC1(R5)        ;ORIGINAL NUMBER NEG
014112  100005                          BPL     INT2            ;NO
014114  005702                          TST     R2              ;ANY BITS ZEROED?
014116  001402                          BEQ     INT1B
014120  005201                          INC     R1              ;ADJUST FOR NEGATIVE
014122  102447                          BVS     INT9            ;OVERFLOW
014124  005401                  INT1B:  NEG     R1
014126  010165  000042          INT2:   MOV     R1,FAC2(R5)
014132  005065  000040          INT2A:  CLR     FAC1(R5)
014136  000207                  INTRTS: RTS     PC
                                ;
014140  020027  002200          INT5:   CMP     R0,#2200        ;CHECK DONE
014144  002005                          BGE     INT6            ;YES
014146  000261                          SEC                     ;SET CARRY BIT
014150  006122                          ROL     R2              ;CREATE PATTERN OF BITS TO CLEAR
014152  062700  000200                  ADD     #200,R0
014156  000770                          BR      INT5
014160  016500  000042          INT6:   MOV     FAC2(R5),R0     ;SAVE OLD FAC2 IN CASE NEG ARG
014164  040265  000042                  BIC     R2,FAC2(R5)     ;CLEAR BITS
014170  005765  000040                  TST     FAC1(R5)        ;CHECK NEG ARG
014174  100360                          BPL     INTRTS          ;NO, DONE
014176  030200                          BIT     R2,R0           ;CHECK EXACT INTEGER ALREADY
014200  001756                          BEQ     INTRTS          ;YES, RETURN
014202  004467  000000G                 JSR     R4,$PULSH       ;NO, MUST SUBTRACT 1
014206  014256                          .WORD   PUSH            ;PUSH FAC
014210  014302                          .WORD   PUSH1           ;PUSH FLOATING 1
014212  000000G                         .WORD   $SBR            ;SUBTRACT
```

```
 3870  014214  014270                        ,WORD   POP             ;POP ANSWER TO FAC
 3871  014216  214136                        ,WORD   INTRTS          ;AND RETURN (OUT OF POLISH MODE)
 3872  014220  005701                INT7:   TST     R1              ;ABS(ARG) < 1
 3873  014222  100403                        BMI     INT8
 3874  014224  005065  000042              CLR     FAC2(R5)        ;IF + THEN ANS IS 0
 3875  014230  000740                        BR      INT2A
 3876  014232  012765  177777  000042  INT8:  MOV     #177777,FAC2(R5) ;IF - THEN ANS IS -1
 3877  014240  000734                        BR      INT2A
 3878  014242  012765  143600  000040  INT9:  MOV     #143600,FAC1(R5)
 3879  014250  005065  000042              CLR     FAC2(R5)
 3880  014254  000730                        BR      INTRTS
 3881
 3882  014256  016546  000042          PUSH:  MOV     FAC2(R5),-(SP)
 3883  014262  016546  000040                 MOV     FAC1(R5),-(SP)
 3884  014266  000134                        JMP     @(R4)+
 3885  014270  012665  000040          POP:   MOV     (SP)+,FAC1(R5)
 3886  014274  012665  000042                 MOV     (SP)+,FAC2(R5)
 3887  014300  000134                        JMP     @(R4)+
 3888  014302  005046                PUSH1:  CLR     -(SP)
 3889  014304  012746  040200              MOV     #40200,-(SP)
 3890  014310  000134                        JMP     @(R4)+
 3891
 3892
 3893
 3894
 3895
 3896                                  ;+----------------------------------------------------------
 3897                                  ;
 3898                                  ; IOWAIT - WASTE TIME TILL NEXT INTERRUPT
 3899                                  ;
 3900                                  ; CALL: JSR     PC,IOWAIT
 3901                                  ;
 3902  014312  005265  000070          IOWAIT: INC     @NDCT(R5)
 3903  014316  105765  000100              TSTB    CNCFLG(R5)
 3904  014322  001402                        BEQ     WTRET
 3905  014324  000167  164546                JMP     READY
 3906  014330  005737  000050          WTRET:  TST     @#50            ;CHECK WAIT LOOP ADDR
 3907  014334  001402                        BEQ     .+6
 3908  014336  000137  000050                JMP     @#50            ;SPECIAL WAIT ROUTINE
 3909  014342  000207                        RTS     PC
 3910
```



```
 3911                                  ;+----------------------------------------------------------
 3912                                  ;
 3913                                  ; LINGET - EDIT A LINE INTO LINE BUFFER USING GETCHAR
 3914                                  ;
 3915                                  ; CALL: USER AREA BASE INTO R5
 3916                                  ;       JSR     PC,LINGET
 3917                                  ;
 3918                                  ;  PRESERVES ALL REGISTERS
 3919                                  ;
 3920                                  ;  RECOGNIZES '@' AND <RUB OUT> FOR RUB OUT AND <ALT MODE>
 3921                                  ;   AND 'U' FOR LINE DELETE; <CR> AS LINE TERMINATOR;
 3922                                  ;   THROWS AWAY ALL OTHERS BELOW ASCII 40 AND ABOVE
 3923                                  ;   ASCII 137.
 3924                                  ;
 3925  014344  004567  002512          LINGET: JSR     R5,SAVREG       ;SAVE REGS;
 3926  014350  116500  000077          LINA:   MOVB    IDEV(R5),R0     ;CHAR, INPUT DEV, CODE
 3927  014354  016001  014460                  MOV     TAB3(R0),R1     ;TO SELECT DEV;
 3928  014360  005700                        TST     R0
 3929  014362  001002                        BNE     LINEIN
 3930  014364  060501                        ADD     R5,R1           ;USER BASE
 3931  014366  011101                        MOV     (R1),R1         ;HAVE USER BUFF. HDR.
 3932  014370  016502  000020          LINEIN: MOV     LINE(R5),R2
 3933  014374  020265  000020          LINRUB: CMP     R2,LINE(R5)     ;DON'T RUB OUT TOO MUCH
 3934  014400  001401                        BEQ     DOCHAR
 3935  014402  005302                        DEC     R2
 3936  014404  004767  177040          DOCHAR: JSR     PC,GETCHAR      ;DON'T COME BACK TILL YOU GOT ONE
 3937  014410  103001                        BCC     GOTONE
 3938  014412  000207                        RTS     PC              ;INDICATE INCOMPLETE LINE (CARRY SET)
 3939  014414  112012                GOTONE: MOVB    R0,(R2)         ;PUT HER IN
 3940  014416  004367  173602              JSR     R3,CHKCHR       ;RETURN EXEC, ONE OF NEXT FIVE LOCS,
 3941  014422  000752                        BR      LINA            ;IF LINE DELETE
 3942  014424  000207                        RTS     PC              ;DONE (<CR>) (CARRY CLEAR)
 3943  014426  000762                        BR      LINRUB
 3944  014430  000765                        BR      DOCHAR          ;MEANINGLESS CHARS,
 3945  014432  005202                        INC     R2              ;GOOD CHAR,
 3946  014434  020265  000016              CMP     R2,CODE(R5)     ;CHECK LINE SPACE OVERFLOW
 3947  014440  103761                        BLO     DOCHAR
 3948  014442  004167  001020              JSR     R1,MSGERR
 3949  014446     015     012                ,BYTE   CR,LF
 3950                                        ,IFNDF  $LONGER
 3951  014450  052114     114                ,ASCII  'LTL'
 3952                                        ,ENDC
 3953                                        ,IFDF   $LONGER
 3954                                        ,ASCII  'LINE TOO LONG'
 3955                                        ,ENDC
 3956  014453     015     012                ,BYTE   CR,LF
 3957  014455     000                        ,BYTE   0
 3958                                        ,EVEN
 3959  014456  000744                        BR      LINEIN
 3960                                  ;
 3961                                  TAB3:
 3962  014460  001172                        +       KBHD
 3963                                        ,IFNDF  $NOPTP
 3964  014462  021242                        +       PRBFHD
 3965                                        ,ENDC
```

3966


```
3967                                    ;+-----------------------------------------------
3968                                    ; 'LITEVAL' SUBROUTINE
3969                                    ;               CALLED BY JSR PC,LITEVAL
3970                                    ;               R1 POINTS TO THE CODE
3971                                    ;               THIS SUBROUTINE IS CALLED TO EVALUATE A
3972                                    ;               LITERAL IN THE CODE,
3973  014464  005000                    LITEVAL:CLR     R0
3974  014466  005065  000040                   CLR     FAC1(R5)
3975  014472  005065  000042                   CLR     FAC2(R5)
3976  014476  121327  000232                   CMPB    (R3),#'+,PLUS
3977  014502  001404                           BEQ     LEVPLUS
3978  014504  121327  000234                   CMPB    (R3),#'-,MINUS
3979  014510  001002                           BNE     LEVLIT
3980  014512  005100                           COM     R0
3981  014514  005203                    LEVPLUS:INC    R3
3982  014516  122327  000375            LEVLIT: CMPB    (R3)+,#',,ILIT1
3983  014522  001416                           BEQ     LEV1LI
3984  014524  124327  000374                   CMPB    -(R3),#',,FLIT
3985  014530  001404                           BEQ     LEVFLI
3986  014532  122327  000376                   CMPB    (R3)+,#',,ILIT2
3987  014536  001406                           BEQ     LEV2LI
3988  014540  000207                           RTS     PC
3989  014542  005203                    LEVFLT: INC     R3
3990  014544  112365  000041                   MOVB    (R3)+,FAC1+1(R5)
3991  014550  112365  000040                   MOVB    (R3)+,FAC1(R5)
3992  014554  112365  000043            LEV2LT: MOVB    (R3)+,FAC2+1(R5)
3993  014560  112365  000042            LEV1LT: MOVB    (R3)+,FAC2(R5)
3994  014564  005700                           TST     R0
3995  014566  001411                           BEQ     LEVPOS
3996  014570  005765  000040                   TST     FAC1(R5)
3997  014574  001003                           BNE     LEVFNEG
3998  014576  005465  000042                   NEG     FAC2(R5)
3999  014602  000403                           BR      LEVPOS
4000  014604  062765  100000  000040    LEVFNEG:ADD    #100000,FAC1(R5)
4001  014612  062716  000002            LEVPOS: ADD     #2,(SP)
4002  014616  000207                           RTS     PC
4003
```

```
                                ;*****************************************************
                                ;  SUBROUTINE 'LOCGET'  CALLED BY JSR PC
                                ;                       GETS LOC OF ELEMENT IN ARRAY (CHECKS SUBSCRIPTS)
                                ;                       R0  MUST CONTAIN SS1     GETS DESTROYED
                                ;                       R1  UNUSED
                                ;                       R2  MUST POINT TO VAR    GETS SET TO RESULT
                                ;                       R3  MUST CONTAIN SS2     GETS DESTROYED
                                ;                       R4  UNUSED
                                ;                       R5  MUST POINT TO USER AREA
                                ;                       SP  GOES ?? DEEPER AFTER JSR
014620  021227  177775          LOCGET: CMP     (R2),#,SCALAR
014624  001403                          BEQ     LOCALOC
014626  005762  000004                  TST     4(R2)
014632  100015                          BPL     LOCSS1
014634  010246          LOCALOC:MOV     R2,-(SP)
014636  010446                  MOV     R4,-(SP)
014640  010346                  MOV     R3,-(SP)
                                ;
                                        .IFNDF  $NOSTR
                                        JSR     PC,UNPACK
                                        .ENDC
                                ;
014642  012703  000012                  MOV     #12,R3
014646  011604                  MOV     (SP),R4
014650  100401                  BMI     .+4
014652  010304                  MOV     R3,R4
014654  004767  172676                  JSR     PC,ALLOC
014660  012603                  MOV     (SP)+,R3
014662  012604                  MOV     (SP)+,R4
014664  012602                  MOV     (SP)+,R2
014666  020062  000004          LOCSS1: CMP     R0,4(R2)
014672  101040                  BHI     ERRSS3
014674  005703                  TST     R3
014676  100427                  BMI     LOCNO2
014700  005762  000006                  TST     6(R2)
014704  100433                  BMI     ERRSS3
014706  020362  000006                  CMP     R3,6(R2)
014712  101030                  BHI     ERRSS3
014714  016246  000004                  MOV     4(R2),-(SP)             ;****
014720  005216                  INC     (SP)                    ;*  *
014722  010346                  MOV     R3,-(SP)                ;*  *
014724  012746  000020                  MOV     #20,-(SP)               ;*  *
014730  006303          LOCLOOP:ASL     R3                      ;*  *
014732  006366  000002                  ASL     2(SP)                   ;*  *  MYULTIPLY SS2 BY SS1MAX
014736  103002                  BCC     .+6                     ;*  *  RESULT IN R3
014740  066603  000004                  ADD     4(SP),R3                ;*  *
014744  005316                  DEC     (SP)                    ;*  *
014746  003370                  BGT     LOCLOOP                 ;*  *
014750  022626                  CMP     (SP)+,(SP)+             ;*  *
014752  005726                  TST     (SP)+                   ;****
014754  060300                  ADD     R3,R0
014756  005200          LOCNO2: INC     R0
014760  006300                  ASL     R0
                                ;
                                        .IFNDF  $NOSTR
```



```
                                        CMP     (R2),#,SVAR
                                        BEQ     .+4
                                        .ENDC
                                ;
014762  006300                          ASL     R0
014764  016202  000002                  MOV     2(R2),R2
014770  060002                  ADD     R0,R2
014772  000207                  RTS     PC
014774  000004          ERRSS3: IOT
                                        .IFNDF  $LONGER
014776  047523     102                  .ASCII  \$OB\
                                        .ENDC
                                        .IFDF   $LONGER
                                        .ASCII  'SUBSCRIPT OUT OF BOUNDS'
                                        .ENDC
015001     000                  .BYTE 0
                                        .EVEN
                                        .EOT
```

```
                                        ;                                SOURCE FILE #7
                                        ;-------------------------------------------------
                                        ;  SUBROUTINE 'LSTPROG' CALLED BY JSR PC
                                        ;                       LISTS THE USER PROGRAM THROUGH 'PUTCHAR'
                                        ;                          R0 - R4 DESTROYED
                                        ;
                                        ;                       R5  MUST POINT TO USER AREA
                                        ;                       SP  GOES ?? DEEPER AFTER JSR
015002  016501  000016          LSTPROG:MOV     CODE(R5),R1
015006  112102                  LSTLOOP:MOVB    (R1)+,R2
015010  002142                          BGE     LSTPTN
015012  120227  000201                  CMPB    R2,#,EOL
015016  001444                          BEQ     LSTEOL
015020  120227  000225                  CMPB    R2,#,EOF
015024  001001                          BNE     .+4
015026  000207                          RTS     PC
015030  120227  000374                  CMPB    R2,#,FLIT
015034  103064                          BHIS    LSTSPEC
015036  042702  177400                  BIC     #177400,R2
015042  013703                          MOV     PC,R3
015044  062703  163340                  ADD     #KEYWDS-LSTPC,R3
015050  013304                  LSTSRCH:MOV     R3,R4           ;R4 IS START OF KEYWORD
015052  112300                          MOVB    (R3)+,R0
015054  100376                          BPL     .-2             ;LOOP TILL GET END KEYWORD
015056  120002                          CMPB    R0,R2           ;COMPARE VALUES
015060  001373                          BNE     LSTSRCH
015062  112400                  LSTKWD: MOVB    (R4)+,R0
015064  100403                          BMI     LSTCHK
015066  004767  001004                  JSR     PC,PUTCHAR
015072  000773                          BR      LSTKWD
015074  124127  000211          LSTCHK: CMPB    -(R1),#,NEXT
015100  001410                          BEQ     LSTNEXT
015102  122127  000202                  CMPB    (R1)+,#,FN
015106  001337                          BNE     LSTLOOP
015110  112100                  LSTFN:  MOVB    (R1)+,R0
015112  062700  000200                  ADD     #'A-'A+2,R0
015116  006000                          ROR     R0
015120  000427                          BR      LSTCHAR
015122  062701  000013          LSTNEXT:ADD     #13,R1
015126  000727                          BR      LSTLOOP
015130  111102                  LSTEOL: MOVB    (R1),R2
015132  100010                          BPL     LSTLIN
015134  120227  000225                  CMPB    R2,#,EOF
015140  001015                          BNE     LSTBSLH
015142  004167  000354          LSTCRLF:JSR     R1,MSGODEV
015146      015     012     000         .BYTE   CR,LF,0
015152                                  .EVEN
015152  000715                          BR      LSTLOOP
015154  000302                  LSTLIN: SWAB    R2
015156  005201                          INC     R1
015160  151102                          BISB    (R1),R2
015162  005301                          DEC     R1
015164  061502                          ADD     (R5),R2
015166  021227  177775                  CMP     (R2),#,SCALAR
015172  103763                          BLO     LSTCRLF
015174  012700  000134          LSTBSLH:MOV     #'\,R0
```



```
015200  004767  001472          LSTCHAR:JSR     PC,PUTCHAR
015204  000700                          BR      LSTLOOP
015206  120227  000374          LSTSPEC:CMPB    R2,#,FLIT
015212  001425                          BEQ     LSTFLIT
015214  120227  000376                  CMPB    R2,#,ILIT2
015220  103406                          BLO     LSTIL1
015222  001412                          BEQ     LSTIL2
015224  112100                  LSTTEXT:MOVB    (R1)+,R0
015226  001667                          BEQ     LSTLOOP
015230  004767  001442                  JSR     PC,PUTCHAR
015234  000773                          BR      LSTTEXT
015236  105065  000043          LSTIL1: CLRB    FAC2+1(R5)
015242  112165  000042                  MOVB    (R1)+,FAC2(R5)
015246  000404                          BR      LSTILB
015250  112165  000043          LSTIL2: MOVB    (R1)+,FAC2+1(R5)
015254  112165  000042                  MOVB    (R1)+,FAC2(R5)
015260  005065  000040          LSTILB: CLR     FAC1(R5)
015264  000410                          BR      LSTFLB
015266  112165  000041          LSTFLIT:MOVB    (R1)+,FAC1+1(R5)
015272  112165  000040                  MOVB    (R1)+,FAC1(R5)
015276  112165  000043                  MOVB    (R1)+,FAC2+1(R5)
015302  112165  000042                  MOVB    (R1)+,FAC2(R5)
015306  004767  000434          LSTFLB: JSR     PC,NUMOUT
015312  000167  177470          LSTJMP: JMP     LSTLOOP
015316  000302                  LSTPTR: SWAB    R2
015320  152102                          BISB    (R1)+,R2
015322  061502                          ADD     (R5),R2
015324  021227  177775                  CMP     (R2),#,SCALAR
015330  103030                          BHIS    LSTVAR
015332  011202                          MOV     (R2),R2
015334  002405                          BLT     LSTLNO
015336  010265  000042                  MOV     R2,FAC2(R5)
015342  005065  000040                  CLR     FAC1(R5)
015346  000414                          BR      LSTLNX
015350  110265  000043          LSTLNO: MOVB    R2,FAC2+1(R5)
015354  105065  000042                  CLRB    FAC2(R5)
015360  000302                          SWAB    R2
015362  110265  000040                  MOVB    R2,FAC1(R5)
015366  105065  000041                  CLRB    FAC1+1(R5)
015372  062765  043600  000040          ADD     #43600,FAC1(R5)
015400  004767  000342          LSTLNX: JSR     PC,NUMOUT
015404  012700  000040                  MOV     #BL,R0
015410  000673                          BR      LSTCHAR
015412  116200  000010          LSTVAR: MOVB    10(R2),R0
015416  004767  001254                  JSR     PC,PUTCHAR
015422  116200  000011                  MOVB    11(R2),R0
015426  001402                          BEQ     .+6
015430  004767  001242                  JSR     PC,PUTCHAR

                                        ,IFDF   $NOSTR
015434  000726                          BR      LSTJMP
                                        ,ENDC
                                        ,IFNDF  $NOSTR
                                        CMP     (R2),#,SVAR
                                        BNE     LSTJMP
```

```
4188                                    MOV     #[$,R0
4189                                    BR      LSTCHAR
4190                                    .ENDC
4191
```



```
4192                                    .IFNDF  $NOSTR
4193
4194                    ;+-----------------------------------------------
4195                    ;  SUBROUTINE 'MAKESTR' CALLED BY JSR PC
4196                    ;                       MAKES A BASIC STRING FROM A STRING OF CHARACTERS
4197                    ;                       R0  DESTROYED
4198                    ;                       R1  UNUSED
4199                    ;                       R2  MUST POINT TO A WORD WHICH CONTAINS 3 LESS
4200                    ;                           THAN THE ADDRESS OF THE FIRST CHARACTER
4201                    ;                       R3  DESTROYED
4202                    ;                       R4  UNUSED
4203                    ;                       R5  MUST POINT TO USER AREA
4204                    ;                       SP  ON ENTRY 0(SP) MUST CONTAIN # CHARACTERS
4205                    ;                           ON EXIT 2(SP) CONTAINS POINTER TO THE STRING
4206                    MAKESTR:JSR     PC,MAKETRY      ;WILL NEW STRING FIT?
4207                            BLOS    MAKGOT          ;YES
4208                            JSR     PC,DNPACK       ;NO, GARBAGE COLLECT
4209                            JSR     PC,MAKETRY      ;TRY AGAIN
4210                            BLOS    MAKGOT          ;FITS THIS TIME
4211                    ERRSOV: IOT
4212                            .IFNDF  $LONGER
4213                            .ASCII  \$SO\
4214                            .ENDC
4215                            .IFDF   $LONGER
4216                            .ASCII  'STRING STORAGE OVERFLOW'
4217                            .ENDC
4218                            .BYTE 0
4219                            .EVEN
4220                    MAKCHK: JSR     PC,MAKETRY
4221                            BHI     ERRSOV
4222                    MAKGOT: MOV     R0,HISTR(R5)    ;SAVE NEW HIGH STRING ADDR
4223                            MOV     2(SP),R0        ;R0 NOW CONTAINS # CHARS,
4224                            MOV     (R2),R2
4225                            ADD     #3,R2           ;R2 NOW CONTAINS ADDRESS OF CHARS,
4226                            MOVB    R0,(R3)+                ;R3 PUTS CHARACTERS IN
4227                            CMPB    (R3)+,(R3)+
4228                            MOVB    (R2)+,(R3)+
4229                            DEC     R0
4230                            BGT     .-4
4231                            MOV     2(SP),R0
4232                            MOVB    R0,(R3)
4233                            SUB     R0,R3
4234                            MOV     SP,R0
4235                            TST     (R0)+
4236                            MOVB    R0,-(R3)
4237                            SWAB    R0
4238                            MOVB    R0,-(R3)
4239                            DEC     R3
4240                            MOV     R3,2(SP)
4241                            RTS     PC
4242
4243                    ;       SUBROUTINE TO CHECK ROOM ENOUGH FOR STRING
4244                    MAKETRY:MOV     HISTR(R5),R0
4245                            MOV     R0,R3
4246                            ADD     4(SP),R0
```

```
4247                                    ADD     #4,R0
4248                                    CMP     R0,HIFREE(R5)
4249                                    RTS     PC
4250                                    .ENDC
4251
4252
4253
4254
4255                            ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++
4256                            ;  SUBROUTINE "MPYTEN"  CALLED BY JSR PC
4257                            ;                       MULTIPLIES R3,R4 BY DECIMAL 10
4258                            ;                       R0,R1,R2  UNUSED
4259                            ;                       R3,R4  IS THE 32 BIT UNSIGNED INTEGER TO MULTPLY
4260                            ;                       R5  UNUSED
4261                            ;                       SP  GOES 4 DEEPER AFTER JSR
4262  015436  010346            MPYTEN: MOV     R3,-(SP)
4263  015440  010446                    MOV     R4,-(SP)
4264  015442  006304                    ASL     R4
4265  015444  006103                    ROL     R3
4266  015446  006304                    ASL     R4
4267  015450  006103                    ROL     R3
4268  015452  062604                    ADD     (SP)+,R4
4269  015454  005503                    ADC     R3
4270  015456  062603                    ADD     (SP)+,R3
4271  015460  006304                    ASL     R4
4272  015462  006103                    ROL     R3
4273  015464  000207                    RTS     PC
4274
```



```
4275                            ;
4276                            ; MSG - OUTPUT A LINE TO TTY
4277                            ; MSGODEV - OUTPUT A LINE TO CURR. OUTPUT DEV.
4278                            ;
4279                            ; CALL: JSR     R1,MSG (MSGODEV)
4280                            ;       .ASCII  "[MESSAGE]"
4281                            ;       .BYTE   0
4282                            ;       .EVEN
4283                            ;                       ;RETURN HERE
4284                            ;
4285                            ;  USES R0
4286                            ;
4287                            ;  SET UP LINE WITH NUMBER OF BYTES TERMINATED
4288                            ;   BY A BYTE OF 000.
4289                            ;
4290                            MSGERR:
4291                                    .IFNDF  $LONGER
4292  015466  112700  000045           MOVB    #'%,R0
4293  015472  000401                    BR      MSGCOM
4294                                    .ENDC
4295  015474  112100            MSG:    MOVB    (R1)+,R0
4296  015476  105065  000107    MSGCOM: CLRB    CNOFLG(R5)
4297  015502  016546  000034           MOV     COLUMN(R5),-(SP)        ;SAVE FOR TEMP SWITCH
4298  015506  012765  000036  000034   MOV     #CLMNITY,COLUMN(R5)
4299  015514  060565  000034           ADD     R5,COLUMN(R5)
4300  015520  000404                    BR      FRSTOUT
4301  015522  016546  000034    MSGODEV:MOV     COLUMN(R5),-(SP)
4302  015526  112100            DOMSG:  MOVB    (R1)+,R0
4303  015530  001403                    BEQ     LINDUN
4304  015532  004767  001140    FRSTOUT:JSR     PC,PUTCHAR              ;PUT CHAR, TO TTY
4305  015536  000773                    BR      DOMSG           ;DO NEXT CHAR
4306  015540  005201            LINDUN: INC     R1              ;TO INSURE RETURN ON
4307  015542  006201                    ASR     R1              ;  EVEN WORD BOUNDARY
4308  015544  006301                    ASL     R1
4309  015546  012665  000034           MOV     (SP)+,COLUMN(R5)
4310  015552  000201                    RTS     R1
4311
```

```
                                        ;-------------------------------------------------------
                                        ; SUBROUTINE 'NORM'     NORMALIZES INTEGER CONTAINED IN
                                        ;                       R3 AND R4, MULTIPLIED BY EXPONENT
                                        ;                       IN R2.  ANSWER IS IN R3, R4,
                                        ;                       CALLED BY JSR PC
015554  012746  000237          NORM:   MOV     #237,-(SP)
015560  005703                          TST     R3
015562  001413                          BEQ     LITTST
015564  100033                          BPL     LITNORM
015566  006003                          ROR     R3
015570  006004                          ROR     R4
015572  005216                          INC     (SP)
015574  030327  040000          LITNORM:BIT     R3,#40000
015600  001010                          BNE     LITOK
015602  006304                          ASL     R4
015604  006103                          ROL     R3
015606  005316                          DEC     (SP)
015610  000771                          BR      LITNORM
015612  005704                  LITTST: TST     R4
015614  001367                          BNE     LITNORM
015616  005726                          TST     (SP)+
015620  000207                          RTS     PC
015622  005702                  LITOK:  TST     R2
015624  001425                          BEQ     LITSTO
015626  100416                          BMI     LITDIV
015630  006203                          ASR     R3
015632  006004                          ROR     R4
015634  006203                          ASR     R3
015636  006004                          ROR     R4
015640  006203                          ASR     R3
015642  006004                          ROR     R4
015644  006203                          ASR     R3
015646  006004                          ROR     R4
015650  062716  000004                  ADD     #4,(SP)
015654  004767  177556                  JSR     PC,MPYTEN
015660  005322                          DEC     R2
015662  000744                          BR      LITNORM
015664  004767  172070          LITDIV: JSR     PC,DIVTEN
015670  005202                          INC     R2
015672  000740                          BR      LITNORM
015674  006203                  LITSHR: ASR     R3
015676  006004                          ROR     R4
015700  030327  177000          LITSTO: BIT     R3,#177000
015704  001373                          BNE     LITSHR
015706  005716                          TST     (SP)
015710  003002                          BGT     .+6
015712  012716  000001                  MOV     #1,(SP)
015716  021627  000377                  CMP     (SP),#377
015722  101402                          BLOS    .+6
015724  012716  000377                  MOV     #377,(SP)
015730  110366  000001                  MOVB    R3,1(SP)
015734  012603                          MOV     (SP)+,R3
015736  000303                          SWAB    R3
015740  006003                          ROR     R3
015742  006004                          ROR     R4
```



```
015744  000207                          RTS     PC
```

```
                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ; 'NUMOUT' SUBROUTINE
                                ;               CALLED BY JSR PC,NUMOUT
                                ;               OUTPUTS AN UNSIGNED NUMBER FROM THE FAC
                                ;               VIA THE SUBROUTINE PUTCHAR,
015746  004567  001110        NUMOUT: JSR     R5,SAVREG
015752  012701  016676                MOV     #PUTCHAR,R1
015756  000443                        BR      NUMSTI


                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ; 'NUMSGN' SUBROUTINE
                                ;               CALLED BY JSR PC,NUMSGN
                                ;                       ,WORD OUTPUT
                                ;               WHERE OUTPUT IS THE OUTPUT ROUTINE,
                                ;               WHICH MAY BE PUTCHAR OR SAVCHAR,
                                ;               OUTPUTS A SIGNED NUMBER FROM THE
                                ;               FAC VIA THE OUTPUT ROUTINE,
015760  017600  000000        NUMSGN: MOV     @(SP),R0
015764  062716  000002                ADD     #2,(SP)
015770  004567  001066                JSR     R5,SAVREG
015774  010001                        MOV     R0,R1
015776  005765  000040                TST     FAC1(R5)
016002  001410                        BEQ     NUMFIX
016004  100025                        BPL     NUMPOS
016006  062765  100000  000040        ADD     #100000,FAC1(R5)
016014  001016                        BNE     NUMNEG
016016  005065  000042                CLR     FAC2(R5)
016022  001016                        BNE     NUMPOS
016024  005765  000042        NUMFIX: TST     FAC2(R5)
016030  100013                        BPL     NUMPOS
016032  005465  000042                NEG     FAC2(R5)
016036  102005                        BVC     NUMNEG
016040  012765  044000  000040        MOV     #44000,FAC1(R5)
016046  005065  000042                CLR     FAC2(R5)
016052  012700  000055        NUMNEG: MOV     #'-,R0
016056  000402                        BR      NUMPRS
                                NUMPOS:
                                        .IFNDF  $NOSTR
                                        CMP     R1,#SAVCHAR
                                        BEQ     NUMSTI          ;DON'T OUTPUT BLANK FOR STRS
                                        .ENDC

016060  012700  000040                MOV     #BL,R0
016064  004711                NUMPRS: JSR     PC,(R1)

                                NUMSTI:
016066  016504  000042                MOV     FAC2(R5),R4     ;R4 = LOW ORDER MANTISSA,
016072  005002                        CLR     R2              ;R2 = DECIMAL EXPONENT,
016074  016503  000040                MOV     FAC1(R5),R3     ;R3 = HIGH ORDER MANTISSA,
016100  001010                        BNE     NUMFLT
016102  012700  000037                MOV     #37,R0          ;R0 = BINARY EXPONENT,
016106  005704                        TST     R4
016110  001016                        BNE     NUMSHFT
016112  012700  000060                MOV     #'0,R0
```



```
016116  004711                        JSR     PC,(R1)
016120  000207                        RTS     PC
016122  010300                NUMFLT: MOV     R3,R0
016124  006300                        ASL     R0
016126  105000                        CLRB    R0
016130  000300                        SWAB    R0
016132  162700  000171                SUB     #171,R0
016136  042703  177600                BIC     #177600,R3
016142  052703  000200                BIS     #200,R3
016146  005300                NUMSHFT:DEC     R0
016150  006304                        ASL     R4
016152  006103                        ROL     R3
016154  030327  040000        NUMNORM:BIT     R3,#40000
016160  001772                        BEQ     NUMSHFT
016162  005700                        TST     R0
016164  003016                        BGT     NUMBIG
016166  006203                        ASR     R3
016170  006004                        ROR     R4
016172  006203                        ASR     R3
016174  006004                        ROR     R4
016176  006203                        ASR     R3
016200  006004                        ROR     R4
016202  006203                        ASR     R3
016204  006004                        ROR     R4
016206  062700  000004                ADD     #4,R0
016212  004767  177220                JSR     PC,MPYTEN
016216  005302                        DEC     R2
016220  000755                        BR      NUMNORM
016222  020027  000004        NUMBIG: CMP     R0,#4
016226  003407                        BLE     NUMOK
016230  004767  172324        NUMDIV: JSR     PC,DIVTEN
016234  005202                        INC     R2
016236  000746                        BR      NUMNORM
016240  005200                NUMALN: INC     R0
016242  006203                        ASR     R3
016244  006004                        ROR     R4
016246  020027  000004        NUMOK:  CMP     R0,#4
016252  002772                        BLT     NUMALN
016254  020327  050000                CMP     R3,#50000
016260  103363                        BHIS    NUMDIV
016262  062704  001250                ADD     #1250,R4        ;ROUNDING,
016266  103010                        BCC     NORNDOV
016270  005203                        INC     R3
016272  020327  050000                CMP     R3,#50000
016276  103404                        BLO     NORNDOV
016300  012703  004000                MOV     #4000,R3
016304  005004                        CLR     R4
016306  005202                        INC     R2
016310  012700  000006        NORNDOV:MOV     #6,R0
016314  010346                NUMDIG: MOV     R3,-(SP)
016316  000316                        SWAB    (SP)
016320  006016                        ROR     (SP)
016322  006016                        ROR     (SP)
016324  006016                        ROR     (SP)
016326  042716  177760                BIC     #177760,(SP)
```

```
 4479  016332  062716  000060                ADD     #'0,(SP)
 4480  016336  042703  174000                BIC     #174000,R3
 4481  016342  004767  177070                JSR     PC,MPYTEN
 4482  016346  005300                        DEC     R0
 4483  016350  003361                        BGT     NUMDIG
 4484  016352  010603                        MOV     SP,R3
 4485  016354  062703  000014                ADD     #14,R3
 4486  016360  020227  177776                CMP     R2,#-2
 4487  016364  002404                        BLT     NUMFM1
 4488  016366  001446                        BEQ     NUMFM2
 4489  016370  020227  000006                CMP     R2,#6
 4490  016374  002451                        BLT     NUMFM3
 4491  016376  014300            NUMFM1: MOV     -(R3),R0
 4492  016400  004711                        JSR     PC,(R1)
 4493  016402  012700  000056                MOV     #'.,R0
 4494  016406  004711                        JSR     PC,(R1)
 4495  016410  012704  000005                MOV     #5,R4
 4496  016414  014300            NUMLP1: MOV     -(R3),R0
 4497  016416  004711                        JSR     PC,(R1)
 4498  016420  005304                        DEC     R4
 4499  016422  003374                        BGT     NUMLP1
 4500  016424  012700  000105                MOV     #'E,R0
 4501  016430  004711                        JSR     PC,(R1)
 4502  016432  012700  000053                MOV     #'+,R0
 4503  016436  005702                        TST     R2
 4504  016440  100003                        BPL     .+10
 4505  016442  012700  000055                MOV     #'-,R0
 4506  016446  005402                        NEG     R2
 4507  016450  004711                        JSR     PC,(R1)
 4508  016452  012700  000060                MOV     #'0,R0
 4509  016456  162702  000012                SUB     #12,R2
 4510  016462  100402                        BMI     .+6
 4511  016464  005200                        INC     R0
 4512  016466  000773                        BR      .-10
 4513  016470  004711                        JSR     PC,(R1)
 4514  016472  010200                        MOV     R2,R0
 4515  016474  062700  000072                ADD     #'0+12,R0
 4516  016500  004711                        JSR     PC,(R1)
 4517  016502  000435                        BR      NUMEXIT
 4518  016504  012700  000056            NUMFM2: MOV     #'.,R0
 4519  016510  004711                        JSR     PC,(R1)
 4520  016512  012700  000060                MOV     #'0,R0
 4521  016516  004711                        JSR     PC,(R1)
 4522  016520  012704  000006            NUMFM3: MOV     #6,R4
 4523  016524  010600                        MOV     SP,R0
 4524  016526  022027  000060                CMP     (R0)+,#'0
 4525  016532  001002                        BNE     .+6
 4526  016534  005304                        DEC     R4
 4527  016536  000773                        BR      .-10
 4528  016540  020402                        CMP     R4,R2
 4529  016542  003002                        BGT     .+6
 4530  016544  010204                        MOV     R2,R4
 4531  016546  005204                        INC     R4
 4532  016550  005202                        INC     R2
 4533  016552  005202                        INC     R2
```



```
 4534  016554  005302            NUMLP3: DEC     R2
 4535  016556  001003                    BNE     .+10
 4536  016560  012700  000056            MOV     #'.,R0
 4537  016564  004711                    JSR     PC,(R1)
 4538  016566  014300                    MOV     -(R3),R0
 4539  016570  004711                    JSR     PC,(R1)
 4540
 4541  016572  005304                    DEC     R4
 4542  016574  003367                    BGT     NUMLP3
 4543  016576  062706  000014    NUMEXIT:ADD     #14,SP
 4544  016602  000207                    RTS     PC
 4545
 4546                                    .IFNDF  $NOSTM
 4547                            SAVCHAR:
 4548                                    JSR     R5,SAVREG
 4549                                    MOV     T2(R5),R1
 4550                                    MOVB    R0,(R1)+
 4551                                    MOV     R1,T2(R5)
 4552                                    INC     T1(R5)
 4553                                    RTS     PC
 4554                                    .ENDC
 4555
```

```
4556                                    ;
4557                                    ; PUTBYT - PUT BYTE INTO RING BUFFER
4558                                    ;
4559                                    ; CALL: MOV     [BUFF, HDR',],R1
4560                                    ;       MOV     [CHAR],R0
4561                                    ;       JSR     PC,PUTBYT
4562                                    ;
4563                                    ;  USES R0,R1,R2,R3
4564                                    ;
4565                                    ;  RAISE PRIORITY SINCE THIS MAY BE CALLED AT
4566                                    ;   MAINSTREAM, BUT ACCESSES POINTERS THAT MAY CHANGE AT
4567                                    ;    INTERUPT LEVEL.
4568                                    ;  RETURNS WITH 'C' BIT: CLR IF BYTE GOT IN
4569                                    ;                        SET IF NO ROOM
4570                                    ;
4571  016604  012702  177776            PUTBYT: MOV     #PS,R2
4572  016610  011246                            MOV     (R2),-(SP)      ;SAVE STATUS
4573  016612  012712  000340                    MOV     #PR7,(R2)       ;REPLACE WITH HIGHEST
4574  016616  016103  000010                    MOV     BPUT(R1),R3
4575  016622  005203                            INC     R3              ;CANDIDATE FOR NEW POSITION
4576  016624  020361  000002                    CMP     R3,BEND(R1)     ;NEED TO WRAP AROUND?
4577  016630  101402                            BLOS    NOWRAP
4578  016632  016103  000000                    MOV     BSTRT(R1),R3    ;YES: NEW POS, AT TOP
4579  016636  020361  000004            NOWRAP: CMP     R3,BGET1(R1)    ;IF EQUAL TO EITHER GET PTR,,
4580  016642  001412                            BEQ     NOROOM          ;  THEN NO ROOM
4581  016644  020361  000006                    CMP     R3,BGET2(R1)
4582  016650  001407                            BEQ     NOROOM
4583  016652  110071  000010                    MOVB    R0,@BPUT(R1)
4584  016656  010361  000010                    MOV     R3,BPUT(R1)     ;UPDATE PTR,
4585  016662  012612                            MOV     (SP)+,(R2)      ;STATUS BACK
4586  016664  000241                            CLC                     ;SIGNAL SUCCESS
4587  016666  000207                            RTS     PC
4588  016670  012612                    NOROOM: MOV     (SP)+,(R2)      ;STATUS BACK
4589  016672  000261                            SEC                     ;SHOW FAILURE
4590  016674  000207                            RTS     PC
4591
```



```
4592                                    ;
4593                                    ; PUTCHAR - PUT CHAR TO CURRENT OUTPUT DEV;
4594                                    ;
4595                                    ; CALL: (LOAD ODEV(R5))
4596                                    ;       MOV     [CHAR],R0
4597                                    ;       JSR     PC,PUTCHAR
4598                                    ;
4599                                    ;  SAVES ALL REGS;
4600                                    ;
4601                                    ;  TRIES TO FIT CHAR INTO PROPER BUFFER.  GOES TO IOWAIT ON
4602                                    ;   FAILURE.
4603                                    ;
4604  016676  004567  000160            PUTCHAR:JSR     R5,SAVREG
4605  016702  012746  047777                    MOV     #47777,-(SP)    ;INIT TIME OUT COUNT
4606  016706  005275  000034                    INC     @COLUMN(R5)
4607  016712  105765  000106                    TSTB    CNCFLG(R5)
4608  016716  001402                            BEQ     PUTCC0
4609  016720  000167  162152                    JMP     READY
4610  016724  116504  000076            PUTCC0: MOVB    ODEV(R5),R4     ;OUTPUT DEVICE CODE
4611  016730  001003                            BNE     HDRSTUP         ;IF NOT TTY, CONTINUE
4612  016732  105765  000107                    TSTB    CNOFLG(R5)      ;CHECK FOR ^O?
4613  016736  001032                            BNE     OUT010          ;IF SET EXIT IMMEDIATELY
4614  016740  016401  017030            HDRSTUP:MOV     TAB1(R4),R1
4615  016744  005704                            TST     R4              ;WHICH DEVICE?
4616  016746  001002                            BNE     PUTIT           ;NOT TTY
4617  016750  060501                            ADD     R5,R1           ;NEED CURR, USER'S BUFF,
4618  016752  011101                            MOV     (R1),R1         ;NOW, ACTUAL HEADER
4619  016754  004767  177624            PUTIT:  JSR     PC,PUTBYT
4620  016760  103007                            BCC     ITSIN
4621  016762  004767  175324                    JSR     PC,IOWAIT       ;NO ROOM: WAIT
4622  016766  005316                            DEC     (SP)            ;TIME OUT
4623  016770  001371                            BNE     PUTIT
4624  016772  105061  000012                    CLRB    BFSPEC(R1)
4625  016776  000422                            BR      DEVERR
4626  017000  105061  000012            ITSIN:  CLRB    BFSPEC(R1)
4627  017004  012774  000100  017036            MOV     #100,@TAB2(R4)  ;ENABLE INTERUPT ON CHOSEN DEV;
4628  017012  005265  000070                    INC     RNDCT(R5)
4629  017016  105761  000012                    TSTB    BFSPEC(R1)      ;I/O ERROR?
4630  017022  001010                            BNE     DEVERR
4631  017024  005726                    OUT010: TST     (SP)+           ;POP TIME OUT COUNT
4632  017026  000207                            RTS     PC              ;RESTORES REGS, AND RETURNS
4633                                    ;
4634                                    ; TAB1 - DEV, BUFFER HDRS, (TPHD IS OFFSET INTO USRAREA
4635                                    ;  FOR ADDR, TO TPRTR, BUFF, HDR',)
4636                                    ;
4637  017030  000120                    TAB1:   +       TPHD
4638                                            ,IFNDF $NOPTP
4639  017032  121306                            +       PPBFHD
4640                                            ,ENDC
4641                                            ,IFDF $NOPTP
4642                                            0
4643                                            ,ENDC
4644
4645                                            ,IFNDF $NOLPT
4646  017034  121352                            +       LPBFHD
```

```
                                        ,ENDC
                                        ,IFDF $NOLPT
                                        0
                                        ,ENDC
                                ;
                                ; TAB2 - DEV, STATUS REG,
                                ;
017036  177564                  TAB2:   .       TPS
017040  177554                          .       PPS
017042  177514                          .       LPS

017044  000004                  DEVERR: TOT
                                        ,IFNDF  $LONGER
017046  047104     122                  ,ASCII  \DNR\
                                        ,ENDC
                                        ,IFDF   $LONGER
                                        ,ASCII  \DEVICE NOT READY\
                                        ,ENDC
017051     000                  .       ,BYTE 0
                                        ,EVEN
                                        ,EOT
```



```
                                ;                               SOURCE FILE #8
                                ;*******************************************************

                                ;
                                ; SAVREG - SAVE ALL REGISTERS
                                ;
                                ; CALL: [JSR    PC,SUBR,]       ;MUST CALL SAVREG FROM SUBRTN,
                                ;       JSR     R5,SAVREG
                                ;
                                ;  PUSHES ALL REGS, AND EXITS WITH ADDR, ON STACK
                                ;   WHICH BRINGS CONTROL BACK WHEN SUBR, DOES (RTS      PC),
                                ;   THEN, RESTORES REGS, AND DOES (RTS PC) WHICH RETURNS TO JUST
                                ;   AFTER CALL TO INITIAL SUBROUTINE (MODIFIED BOWERING SPECIAL)
                                ;
017052  011646                  SAVRG1: MOV     (SP),-(SP)
017054  012766  017122  000002          MOV     #INTEXT,2(SP)
017062  010446                  SAVREG: MOV     R4,-(SP)
017064  010346                          MOV     R3,-(SP)
017066  010246                          MOV     R2,-(SP)
017070  010146                          MOV     R1,-(SP)
017072  010046                          MOV     R0,-(SP)
017074  010546                          MOV     R5,-(SP)        ;FOR RETURN TO SUBR,
017076  016605  000014                  MOV     12.(SP),R5      ;GET OLD R5
017102  004736                          JSR     PC,@(SP)+       ;STACK NEXT LOC,!
017104  012600                  RESREG: MOV     (SP)+,R0
017106  012601                          MOV     (SP)+,R1
017110  012602                          MOV     (SP)+,R2
017112  012603                          MOV     (SP)+,R3
017114  012604                          MOV     (SP)+,R4
017116  012605                          MOV     (SP)+,R5
017120  000207                          RTS     PC              ;BACK TO CALLER OF INIT, SUBR,
                                ;
017122  000002                  INTEXT: RTI


                                ;*******************************************************
                                ;
                                ; SCANPND - SCAN TOKEN FOR '#'
                                ;
                                ; CALL: MOV     [PTR, TO BYTE BEFORE '#' TOKEN],R1
                                ;       JSR     PC,SCANPND
                                ;
                                ;  USES R1
                                ;
017124  012765  177775  000030  SCANPND:MOV     #,SCALAR,LINENO(R5)
017132  005201                          INC     R1
017134  122127  000261                  CMPB    (R1)+,#,POUND
017140  001402                          BEQ     PNDGO
017142  000167  172502                  JMP     ERRSX>
017146  000207                  PNDGO:  RTS     PC
```

```
                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;  SUBROUTINE 'SKIPEOL' CALLED BY JSR PC
                                ;                       MOVES R1 PAST THE NEXT 'EOL'
                                ;                       R0  UNUSED
                                ;                       R1  MODIFIED TO REFLECT OPERATION
                                ;                       R2,R3,R4,R5  UNUSED
                                ;                       SP  GOES NO DEEPER AFTER JSR
017150  062701  000003          SKIP05: ADD     #3,R1
017154  005201                  SKIP02: INC     R1
017156  005201                  SKIP01: INC     R1
017160  105721                  SKIPEOL:TSTB    (R1)+
017162  002375                          BGE     SKIP01
017164  124127  000374                  CMPB    -(R1),#,FLIT
017170  001767                          BEQ     SKIP05
017172  101014                          BHI     SKIPHI
017174  122127  000201                  CMPB    (R1)+,#,EOL
017200  001420                          BEQ     SKIPRTS
017202  124127  000202                  CMPB    -(R1),#,FN
017206  001762                          BEQ     SKIP02
017210  122127  000211                  CMPB    (R1)+,#,NEXT
017214  001361                          BNE     SKIPEOL
017216  062701  000012                  ADD     #12,R1
017222  000756                          BR      SKIPEOL
                                ;       EITHER ,ILIT1(375), ;ILIT2(376) OR ,TEXT(377)
017224  122127  000376          SKIPHI: CMPB    (R1)+,#,ILIT2
017230  001751                          BEQ     SKIP02
017232  103751                          BLO     SKIP01
017234  105721                  SKIPTXT:TSTB    (R1)+
017236  001376                          BNE     SKIPTXT
017240  000747                          BR      SKIPEOL
017242  000207                  SKIPRTS:RTS     PC


                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;  'STOVAR' SUBROUTINE
                                ;                       CALLED BY JSR PC,STOVAR
                                ;                       STORES FAC1, FAC2 IN THE VARIABLE OR
                                ;                       ARRAY ELEMENT LAST ADDRESSED BY THE
                                ;                       SUBROUTINE 'GETVAR'
017244  016502  000022          STOVAR: MOV     VARSAV(R5),R2

                                        .IFNDF  $NOSTM
                                        CMP     (R2),#,SVAR
                                        BEQ     ERRMX7
                                        .ENDC

017250  016500  000024                  MOV     SS1SAV(R5),R0
017254  100405                          BMI     STONOSS
017256  016503  000026                  MOV     SS2SAV(R5),R3
017262  004767  175332                  JSR     PC,LOCGET
017266  000404                          BR      STOCOMM
017270  022227  177775          STONOSS:CMP     (R2)+,#,SCALAR
017274  001401                          BEQ     STOCOMM
017276  011202                          MOV     (R2),R2
```



```
017300  016522  000040          STOCOMM:MOV     FAC1(R5),(R2)+
017304  016512  000042                  MOV     FAC2(R5),(R2)
017310  000207                          RTS     PC

                                        .IFNDF  $NOSTM
                                ERRMX7: JMP     ERRMIX
                                        .ENDC
```

```
                                        .IFNDF  $NOSTK
                                ;+-------------------------------------------------
                                ;  'STOSVAR' SUBROUTINE
                                ;               CALLED BY JSR PC,STOSVAR
                                ;               STORES A STRING VARIABLE AS ADDRESSED BY
                                ;               VARSAV
STOSVAR:MOV     VARSAV(R5),R2
        CMP     (R2),#,SVAR
        BNE     ERRMX6
        MOV     SS1SAV(R5),R0
        BMI     STOSSNO
        MOV     SS2SAV(R5),R3
        JSR     PC,LOCGET
        BR      STOMMC0
STOSSNO:TST     (R2)+
        CMP     2(R2),#-1
        BEQ     STOVTAB
        MOV     (R2),R2
STOMMC0:MOV     (SP)+,R3
        MOV     (SP)+,R0
        MOV     R0,(R2)
        BR      STOVCOM
STOVTAB:MOV     (SP)+,R3
        MOV     (SP)+,R0
        MOV     R0,(R2)
        INC     R2
        SUB     (R5),R2
STOVCOM:INC     R0
        BEQ     STOSX           ;CHECK NULL STRING
        ADD     #2,R0
        MOVB    R2,-(R0)
        SWAB    R2
        MOVB    R2,-(R0)
STOSX:  JMP     (R3)
ERRMX6: JMP     ERRMIX
        .ENDC


                                ;+-------------------------------------------------
                                ;  SUBROUTINE 'SUBSTK'  CALLED BY JSR PC
                                ;                       NEGATES #(SP),?(SP) THEN CONTINUES IN 'ADDSTK'
                                ;                       R0,R1  UNUSED
                                ;                       R2,R3  DESTROYED
                                ;                       R4  MODIFIED TO REFLECT STACK USAGE
                                ;                       R5  MUST POINT TO USER AREA
                                ;                       SP  GOES ?? DEEPER AFTER JSR
017312  005766  000002          SUBSTK: TST     2(SP)
017316  001405                  BEQ     SUBINT
017320  062766  100000  000002  ADD     #100000,2(SP)
017326  000167  170036          ADDSTK: JMP     ADDSTK
017332  005466  000004          SUBINT: NEG     4(SP)
017336  102373                  BVC     ADDSTK
017340  012766  044000  000002  MOV     #44000,2(SP)
```



```
017346  005066  000004          CLR     4(SP)
017352  000765                  BR      ADDSTK
```

```
                                        ;*********************************************
                                        ; 'TRAN' SUBROUTINE
                                        ;               CALLED BY JSR PC,TRAN
                                        ;               TRANSLATES FROM INPUT ASCII CODE
                                        ;               TO INTERNAL CODE, CONSISTING OF TOKENS,
                                        ;               LINE NUMBER REFERENCES, SYMBOL TABLE
                                        ;               REFERENCES, AND LITERALS,  ALWAYS RETURNS,
                                        ;               NO MATTER WHAT IS INPUT,
                                        ;               AS NEW SYMBOLS ARE ENCOUNTERED, BUILDS NEW
                                        ;               ENTRIES INTO THE SYMBOL TABLE,
                                        ;               ERRORS ARE TRANSLATED TO [;TEXT,,,,]
017354  016502  000020          TRAN:   MOV     LINE(R5),R2
017360  010201                          MOV     R2,R1
017362  122127  000015                  CMPB    (R1)+,#CR
017366  001375                          BNE     .-4
017370  016500  000016                  MOV     CODE(R5),R0
017374  114140                          MOVB    -(R1),-(R0)
017376  020102                          CMP     R1,R2           ;R2 IS WHERE ORIGINAL TEXT IS,
017400  001375                          BNE     .-4             ;R1 IS WHERE TRANSLATED TEXT GOES,
017402  005065  000056          TRANLUP:CLR     T1(R5)          ;PREVIOUS ITEM WASN'T A VAR,
017406  122027  000040          TRANVAR:CMPB    (R0)+,#BL
017412  001775                          BEQ     TRANVAR
017414  124027  000015                  CMPB    -(R0),#CR
017420  001003                          BNE     TRYNUM
017422  112711  000201                  MOVB    #,EOL,(R1)
017426  000207                          RTS     PC
017430  121027  000056          TRYNUM: CMPB    (R0),#'.
017434  001406                          BEQ     NUMJMP
017436  121027  000060                  CMPB    (R0),#'0
017442  103405                          BLO     TRYKWD
017444  121027  000071                  CMPB    (R0),#'9
017450  101002                          BHI     TRYKWD
017452  000167  000632          NUMJMP: JMP     I$NUM
017456  012704  160700          TRYKWD: MOV     #KEYWDS-TRNPC,R4
017462  121027  000101                  CMPB    (R0),#'A        ;CHECK ALPHA KEYWORDS
017466  103405                          BLO     COMTAB  ;TOO LOW
017470  121027  000132                  CMPB    (R0),#'Z
017474  101002                          BHI     COMTAB  ;TOO HIGH
017476  012704  160772                  MOV     #KEYA-TRNPC,R4  ;JUST RIGHT
017502  010703          COMTAB: MOV     PC,R3
017504  060403          TRNPC:  ADD     R4,R3           ;ADDRESS TABLE
017506  010002          TRYAGN: MOV     R0,R2
017510  122223          RETRY:  CMPB    (R2)+,(R3)+
017512  001776                  BEQ     RETRY
017514  114304                  MOVB    -(R3),R4
017516  100414                  BMI     AMATCH
017520  001550                  BEQ     NOTKWD
017522  005302                  DEC     R2
017524  122227  000040          CMPB    (R2)+,#BL
017530  001767                  BEQ     RETRY
017532  005302                  DEC     R2
017534  122327  000040          CMPB    (R3)+,#BL
017540  001763                  BEQ     RETRY
017542  105723                  TSTB    (R3)+
```



```
017544  100376                  BPL     .-2
017546  000757                  BR      TRYAGN
017550  005302          AMATCH: DEC     R2
017552  010200                  MOV     R2,R0
017554  110421                  MOVB    R4,(R1)+
017556  120427  000220          CMPB    R4,#,KEM
017562  001540                  BEQ     REMPACK
017564  120427  000262          CMPB    R4,#,FN
017570  001461                  BEQ     TRNFN
017572  120427  000211          CMPB    R4,#,NEXT
017576  001505                  BEQ     NEXFILL
017600  120427  000257          CMPB    R4,#,SQUOT
017604  001403                  BEQ     QUOTPAK
017606  120427  000256          CMPB    R4,#,DQUOT
017612  001273                  BNE     TRANLUP
017614  122704  000257          QUOTPAK:CMPB    #,SQUOT,R4
017620  001402                  BEQ     .+6
017622  012704  000252                  MOV     #'"-"',SQUOT,R4
017626  062704  177570                  ADD     #'",-SQUOT,R4
017632  112721  000377                  MOVB    #,TEXT,(R1)+
017636  220100                  CMP     R1,R0
017640  103076                  BHIS    ERRTRN
017642  121004          STOSTR: CMPB    (R0),R4         ;SAME AS INITIAL QUOTE CHAR,?
017644  001405                  BEQ     ENDQUOT
017646  121027  000015                  CMPB    (R0),#CR
017652  001415                  BEQ     ENDCR
017654  112021                  MOVB    (R0)+,(R1)+
017656  000771                  BR      STOSTR
017660  105021          ENDQUOT:CLRB    (R1)+
017662  005200                  INC     R0
017664  120427  000047          CMPB    R4,#'
017670  001403                  BEQ     ENDSQUO
017672  112721  000256          MOVB    #,DQUOTE,(R1)+
017676  000641                  BR      TRANLUP
017700  112721  000257          ENDSQUO:MOVB    #,SQUOTE,(R1)+
017704  000636                  BR      TRANLUP
017706  105021          ENDCR:  CLRB    (R1)+
017710  112711  000201                  MOVB    #,EOL,(R1)
017714  010102                          MOV     R1,R2
017716  124227  000377                  CMPB    -(R2),#,TEXT
017722  001375                          BNE     .-4
017724  110412                          MOVB    R4,(R2)
017726  112742  000377                  MOVB    #,TEXT,-(R2)
017732  000207                          RTS     PC
017734  122027  000040          TRNFN:  CMPB    (R0)+,#BL
017740  001775                          BEQ     .-4
017742  124027  000101                  CMPB    -(R0),#'A
017746  103411                          BLO     TRFNBAD
017750  121027  000132                  CMPB    (R0),#'Z
017754  101006                          BHI     TRFNBAD
017756  112002                          MOVB    (R0)+,R2
017760  006302                          ASL     R2
017762  162702  000200                  SUB     #'A*'A-2,R2
017766  110221                          MOVB    R2,(R1)+
017770  000604                          BR      TRANLUP
```

```
 4954  017772  112740  000110          TRPNBAD:MOVB    #'N,-(R0)
 4955  017776  112740  000106                  MOVB    #'F,-(R0)
 4956  020002  005301                          DEC     R1
 4957  020004  020100                          CMP     R1,R0
 4958  020006  101013                          BHI     ERRTRN
 4959  020010  000425                          BR      REMPACK
 4960  020012  020100          NEXFILL:CMP     R1,R0
 4961  020014  103010                          BHIS    ERRTRN
 4962  020016  105021                          CLRB    (R1)+
 4963  020020  105011                          CLRB    (R1)
 4964  020022  062701  000011                  ADD     #11,R1
 4965  020026  020100                          CMP     R1,R0
 4966  020030  103002                          BHIS    ERRTRN
 4967  020032  000167  177344                  JMP     TRANLUP
 4968  020036  000167  000266          ERRTRN: JMP     ERRTR7
 4969  020042  121027  000132          NOTKWD: CMPB    (R0),#'Z
 4970  020046  101006                          BHI     REMPACK
 4971  020050  121027  000101                  CMPB    (R0),#'A
 4972  020054  103403                          BLO     REMPACK
 4973  020056  005765  000056                  TST     T1(R5)          ;2 VARS IN A ROW IS AN ERROR SO DONT
 4974  020062  001415                          BEQ     ISVAR           ;WASTE SYMBOL SPACE ON IT,
 4975  020064  112721  000377          REMPACK:MOVB    #,TEXT,(R1)+
 4976  020070  020100                          CMP     R1,R0
 4977  020072  103361                          BHIS    ERRTRN
 4978  020074  121027  000015          STOTXT: CMPB    (R0),#CR
 4979  020100  001402                          BEQ     CARRET
 4980  020102  112021                          MOVB    (R0)+,(R1)+
 4981  020104  000773                          BR      STOTXT
 4982  020106  105021          CARRET: CLRB    (R1)+
 4983  020110  112711  000201                  MOVB    #,EOL,(R1)
 4984  020114  000207                          RTS     PC
 4985  020116  112002          ISVAR:  MOVB    (R0)+,R2
 4986  020120  122027  000040                  CMPB    (R0)+,#BL
 4987  020124  001775                          BEQ     .-4
 4988  020126  124027  000071                  CMPB    -(R0),#'9
 4989  020132  101006                          BHI     NODIGIT
 4990  020134  121027  000060                  CMPB    (R0),#'0
 4991  020140  103403                          BLO     NODIGIT
 4992  020142  000302                          SWAB    R2
 4993  020144  152002                          BISB    (R0)+,R2
 4994  020146  000302                          SWAB    R2
 4995  020150  011503          NODIGIT:MOV     (R5),R3
 4996  020152  122027  000040                  CMPB    (R0)+,#BL
 4997  020156  001775                          BEQ     .-4
 4998  020160  005300                          DEC     R0
 4999  020162  020365  000014          VARSRCH:CMP     R3,LOFREE(R5)
 5000  020166  103020                          BHIS    PUTITIN
 5001  020170  021327  177775                  CMP     (R3),#,SCALAR
 5002  020174  103003                          BHIS    NOTIT
 5003  020176  062703  000004                  ADD     #4,R3
 5004  020202  000767                          BR      VARSRCH
 5005  020204  062703  000010          NOTIT:  ADD     #10,R3
 5006
 5007                                          .IFNDF  $NOSTR
 5008                                          CMP     -10(R3),#,SVAR
```



```
 5009                                          BEQ     TRYSVAR
 5010                                          .ENDC
 5011
 5012  020210  022302                          CMP     (R3)+,R2
 5013  020212  001363                          BNE     VARSRCH
 5014  020214  121027  000044                  CMPB    (R0),#'$
 5015  020220  001760                          BEQ     VARSRCH
 5016
 5017                                          .IFNDF  $NOSTR
 5018                                          BR      FOUNDV
 5019                                  TRYSVAR:CMP     (R3)+,R2
 5020                                          BNE     VARSRCH
 5021                                          CMPB    (R0),#'$
 5022                                          BNE     VARSRCH
 5023                                          INC     R0
 5024                                          .ENDC
 5025
 5026  020222  162703  000012          FOUNDV: SUB     #12,R3
 5027  020226  000415                          BR      RETVAR
 5028                                  PUTITIN:
 5029                                          .IFNDF  $NOSTR
 5030                                          ADD     #14,R3
 5031                                          CMP     R3,LOSTR(R5)    ;MAKE SURE STRINGS ARE NOT THERE
 5032                                          BLO     PUTAOK
 5033                                          JSR     PC,UPPACK       ;IF THEY ARE, PACK THEM UPWARDS
 5034                                          CMP     R3,LOSTR(R5)    ;AND TRY AGAIN
 5035                                          BHIS    ERROV2          ;NO GOOD
 5036                                  PUTAOK: TST     -(R3)           ;R3 IS END OF ENTRY
 5037                                          .ENDC
 5038
 5039                                          .IFDF   $NOSTR
 5040  020230  062703  000012                  ADD     #12,R3          ;ADDRESS END OF ENTRY IN R3
 5041                                          .ENDC
 5042
 5043  020234  020365  000012                  CMP     R3,HIFREE(R5)
 5044  020240  101041                          BHI     ERROV2
 5045  020242  010365  000014                  MOV     R3,LOFREE(R5)
 5046  020246  010243                          MOV     R2,-(R3)
 5047  020250  005043                          CLR     -(R3)
 5048  020252  005043                          CLR     -(R3)
 5049  020254  005043                          CLR     -(R3)
 5050  020256  012743  177775                  MOV     #,SCALAR,-(R3)
 5051
 5052                                          .IFNDF  $NOSTR
 5053                                          CMPB    (R0),#'$
 5054                                          BNE     RETVAR
 5055                                          INC     R0
 5056                                          MOV     #,SVAR,(R3)+
 5057                                          COM     (R3)+
 5058                                          COM     (R3)+
 5059                                          COM     (R3)
 5060                                          SUB     #6,R3
 5061                                          .ENDC
 5062
 5063  020262  010565  000056          RETVAR: MOV     R5,T1(R5)       ;SOMETHING NONZERO,
```

```
5064  020266  161503                  RETLNO: SUB     (R5),R3
5065  020270  000303                          SWAB    R3
5066  020272  110321                          MOVB    R3,(R1)+
5067  020274  000303                          SWAB    R3
5068  020276  110321                          MOVB    R3,(R1)+
5069  020300  020100                          CMP     R1,R0
5070  020302  101255                          BHI     ERRTRN
5071  020304  000167  177076                 JMP     TRANVAR
5072                                  ISNUM:
5073  020310  010046                          MOV     R0,-(SP)        ;SAVE PTR IN CASE OF BAD NUM
5074  020312  004767  000364                 JSR     PC,VAL          ;FIND MANTISSA AND EXPONENT
5075  020316  121027  000056                 CMPB    (R0),#'.
5076  020322  001016                          BNE     EXPTEN
5077  020324  012600                          MOV     (SP)+,R0
5078  020326  000656                          BR      REMPACK
5079  020330  004167  175132         ERRTR7: JSR     R1,MSGERR
5080                                          .IFNDF  $LONGER
5081  020334  046124     124                  .ASCII  \TLT\
5082                                          .ENDC
5083                                          .IFDF   $LONGER
5084                                          .ASCII  'LINE TOO LONG TO TRANSLATE'
5085                                          .ENDC
5086  020337     000                          .BYTE 0
5087                                          .EVEN
5088  020340  000167  160574                 JMP     READY2
5089  020344  004167  175116         ERROV2: JSR     R1,MSGERR
5090                                          .IFNDF  $LONGER
5091  020350  052120     102                  .ASCII  \PTB\
5092                                          .ENDC
5093                                          .IFDF   $LONGER
5094                                          .ASCII  'PROGRAM TOO BIG'
5095                                          .ENDC
5096  020353     000                          .BYTE 0
5097                                          .EVEN
5098  020354  000167  160560                 JMP     READY2
5099  020360  020327  014630         EXPTEN: CMP     R3,#14630
5100  020364  101127                          BHI     MAKFLIT
5101  020366  005702                          TST     R2
5102  020370  003404                          BLE     EXPNEG
5103  020372  004767  175040                 JSR     PC,MPYTEN
5104  020376  005302                          DEC     R2
5105  020400  000767                          BR      EXPTEN
5106  020402  001120         EXPNEG: BNE     MAKFLIT
5107  020404  005703                          TST     R3
5108  020406  001116                          BNE     MAKFLIT
5109  020410  020427  177775                 CMP     R4,#,SCALAR
5110  020414  103113                          BHIS    MAKFLIT
5111  020416  016503  000020                 MOV     LINE(R5),R3
5112  020422  005301                          DEC     R1
5113  020424  020103                          CMP     R1,R3
5114  020426  103452                          BLO     MAKLNO
5115  020430  121127  000204                 CMPB    (R1),#,GOSUB
5116  020434  001447                          BEQ     MAKLNO
5117  020436  121127  000205                 CMPB    (R1),#,GOTO
5118  020442  001444                          BEQ     MAKLNO
```



```
5119  020444  121127  000224                 CMPB    (R1),#,CALL
5120  020450  001441                          BEQ     MAKLNO
5121  020452  121127  000242                 CMPB    (R1),#,THEN
5122  020456  001436                          BEQ     MAKLNO
5123  020460  121127  000277                 CMPB    (R1),#,LIST
5124  020464  001433                          BEQ     MAKLNO
5125  020466  005201                          INC     R1
5126  020470  005003                          CLR     R3
5127  020472  005704                          TST     R4
5128  020474  002463                          BLT     MAKFLIT
5129  020476  020427  000377                 CMP     R4,#377
5130  020502  003003                          BGT     MAKEI2
5131  020504  112721  000375         LITZERO: MOVB    #,ILI1,(R1)+
5132  020510  000407                          BR      MAKEOK
5133  020512  112721  000376         MAKEI2: MOVB    #,ILI2,(R1)+
5134  020516  000304                 LITCOMN: SWAB    R4
5135  020520  020100                          CMP     R1,R0
5136  020522  103010                          BHIS    TRNER4
5137  020524  110421                          MOVB    R4,(R1)+
5138  020526  000304                          SWAB    R4
5139  020530  110421                 MAKEOK: MOVB    R4,(R1)+
5140  020532  005726                          TST     (SP)+
5141  020534  020100                          CMP     R1,R0
5142  020536  101002                          BHI     TRNER4
5143  020540  000167  176636                 JMP     TRANLUP
5144  020544  000167  177266         TRNER4: JMP     ERRTRN
5145  020550  000167  177570         ERROV3: JMP     ERROV2
5146  020554  005201                 MAKLNO: INC     R1
5147  020556  011503                          MOV     (R5),R3
5148  020560  020365  000014         LNOSRCH: CMP     R3,LOFREE(R5)
5149  020564  103013                          BHIS    STOLNO
5150  020566  021327  177775                 CMP     (R3),#,SCALAR
5151  020572  103403                          BLO     ISLNO
5152  020574  062703  000012                 ADD     #12,R3
5153  020600  000767                          BR      LNOSRCH
5154  020602  021304         ISLNO:  CMP     (R3),R4
5155  020604  001414                          BEQ     FOUNDLN
5156  020606  062703  000004                 ADD     #4,R3
5157  020612  000762                          BR      LNOSRCH
5158                                  STOLNO:
5159                                          .IFDF   $NOSTK
5160  020614  062703  000004                 ADD     #4,R3
5161                                          .ENDC
5162
5163                                          .IFNDF  $NOSTK
5164                                          ADD     #6,R3           ;CHECK THAT THE SYMTAB SPACE
5165                                          CMP     R3,LOSTR(R5)    ;IS NOT OCCUPIED BY STRINGS
5166                                          BLO     STOAOK
5167                                          JSR     PC,UPPACK       ;IF IT IS, MOVE STRINGS UP
5168                                          CMP     R3,LOSTR(R5)    ;AND CHECK ROOM ENOUGH AGAIN
5169                                          BHIS    ERROV3
5170                                  STOAOK: TST     -(R3)           ;ADJUST SYMTAB ADDRESS
5171                                          .ENDC
5172
5173  020620  020365  000012                 CMP     R3,HIFREE(R5)
```

```
 5174  020624  101351                    BHI     ERROV3
 5175  020626  710365  000014            MOV     R3,LOFREE(R5)
 5176  020632  005043                    CLR     -(R3)
 5177  020634  010443                    MOV     R4,-(R3)
 5178  020636  005726            FOUNDLNI:TST    (SP)+
 5179  020640  000167  177422            JMP     RETLNO
 5180  020644  005703            MAKFLIT: TST    R3
 5181  020646  001002                    BNE     CALNRM
 5182  020650  005704                    TST     R4
 5183  020652  001714                    BEQ     LITZERO
 5184  020654  004767  174674    CALNRM: JSR     PC,NORM
 5185  020660  112721  000374            MOVB    #'FLIT,(R1)+
 5186  020664  000303                    SWAB    R3
 5187  020666  220100                    CMP     R1,R0
 5188  020670  103325                    BHIS    TRNER4
 5189  020672  110321                    MOVB    R3,(R1)+
 5190  020674  000303                    SWAB    R3
 5191  020676  110321                    MOVB    R3,(R1)+
 5192  020700  000706                    BR      LITCOMN
 5193
 5194
```



```
 5195                            .IFNDF  $NOSTR
 5196                    ;+-------------------------------------------------
 5197                    ;  SUBROUTINE TO UPPACK!  CALLED BY JSR PC
 5198                    ;                        PACKS STRING STORAGE TOWARD HIGH CORE
 5199                    ;                        R0  UNUSED
 5200                    ;                        R1,R2,R3  PRESERVED
 5201                    ;                        R4  UNUSED
 5202                    ;                        R5  MUST POINT TO USER AREA
 5203                    ;                        SP  GOES 1F DEEPER AFTER JSR
 5204                    UPPACK: MOV     R1,-(SP)
 5205                            MOV     R2,-(SP)
 5206                            MOV     R3,-(SP)
 5207                            CLR     -(SP)
 5208                            MOV     HISTR(R5),R1
 5209                            MOV     HIFREE(R5),R2
 5210                            MOV     R2,HISTR(R5)
 5211                    UPPLOOP:CLR     (SP)            ;GET END OF THE NEXT STRING
 5212                            BISB    -(R1),(SP)
 5213                            BNE     UPPNZRO         ;(LAST BYTE CONTAINS THE LENGTH)
 5214                    UPPBAD: CMP     R1,LOSTR(R5)
 5215                            BHI     UPPLOOP
 5216                            MOV     R2,LOSTR(R5)
 5217                            TST     (SP)+
 5218                            MOV     (SP)+,R3
 5219                            MOV     (SP)+,R2
 5220                            MOV     (SP)+,R1
 5221                            RTS     PC
 5222                    UPPNZRO:SUB     (SP),R1         ;ADDRESS BACK PTR
 5223                            CLR     R3
 5224                            BISB    -(R1),R3
 5225                            SWAB    R3
 5226                            BISB    -(R1),R3        ;GET IT IN R3
 5227                            SWAB    R3
 5228                            DEC     R1
 5229                            BIT     R3,#1           ;CHECK REL TO SYMBOLS
 5230                            BEQ     .+6
 5231                            DEC     R3
 5232                            ADD     (R5),R3         ;YES, ADD BASE OF SYM TAB
 5233                            CMP     R3,PDL(R5)      ;MAKE SURE IT'S NOT TOO HI
 5234                            BHIS    UPPBAD
 5235                            CMP     R3,SP           ;IN STACK IS OK
 5236                            BHIS    UPPGOOD
 5237                            CMP     R3,ARRAYS(R5)   ;IN ARRAYS IS GOOD
 5238                            BHI     UPPBAD
 5239                            CMP     R3,HIFREE(R5)   ;IN FREE STORAGE IS BAD
 5240                            BHI     UPPGOOD
 5241                            CMP     R3,LOFREE(R5)
 5242                            BHIS    UPPBAD
 5243                            CMP     R3,(R5)
 5244                            BLO     UPPBAD          ;BELOW SYMBOL TABLE IS BAD
 5245                    UPPGOOD:ADD     #4,(SP)         ;GOOD STRING, MOVE IT UP
 5246                            CMP     (R3),R1
 5247                            BNE     UPPBAD          ;(DON'T GARBAGE COLLECT IT)
 5248                            ADD     (SP),R1
 5249                            SUB     R1,(R3)
```

```
 5250                                           ADD     R2,(R3)
 5251                                           MOVB    -(R1),-(R2)
 5252                                           DEC     (SP)
 5253                                           BGT     .-4
 5254                                           BR      UPPBAD
 5255                                           .ENDC
 5256
```



```
 5257                                   ;-----------------------------------------------------------
 5258                                   ;  SUBROUTINE 'VAL'     CALLED BY JSR R7
 5259                                   ;                       CONVERTS AN ASCII STRING AT (R0)
 5260                                   ;                       TO A VALUE IN R3,R4, AND
 5261                                   ;                       AN EXPONENT IN R2
 5262                                   ;
 5263 020702 005002                    VAL:    CLR     R2              ;DEC PLACES*100000 OR TRAILING ZEROES,
 5264 020704 005003                            CLR     R3              ;HIGH ORDER OF 32 BIT INTEGER,
 5265 020706 005004                            CLR     R4              ;LOW ORDER OF 32 BIT INTEGER,
 5266 020710 122027 000040             NUDIGIT:CMPB    (R0)+,#' 
 5267 020714 001775                            BEQ     .-4
 5268 020716 124027 000060                     CMPB    -(R0),#'0
 5269 020722 103427                            BLO     NOTDIG
 5270 020724 121027 000071                     CMPB    (R0),#'9
 5271 020730 101024                            BHI     NOTDIG
 5272 020732 020327 014630                     CMP     R3,#14630       ;IF HIGH WORD GREATER THAN THIS
 5273 020736 101405                            BLOS    CANFIT          ;THEN CANT FIT ANOTHER DIGIT IN 32 BITS,
 5274 020740 005200                            INC     R0
 5275 020742 005702                            TST     R2              ;CANT FIT DIGITS IN MANTISSA, BIT ITS
 5276 020744 002761                            BLT     NUDIGIT         ;AFTER POINT SO NEEDNT COUNT THEM,
 5277 020746 005202                            INC     R2              ;CANT FIT DIGITS IN MANTISSA SO MUST
 5278 020750 000757                            BR      NUDIGIT         ;KEEP TRACK OF TRAILING ZEROES;
 5279 020752 004767 174460             CANFIT: JSR     PC,MPYTEN
 5280 020756 005046                            CLR     -(SP)
 5281 020760 112016                            MOVB    (R0)+,(SP)      ;AND ADD IN THE DIGIT,
 5282 020762 162716 000000                     SUB     #'0,(SP)
 5283 020766 062604                            ADD     (SP)+,R4
 5284 020770 005503                            ADC     R3
 5285 020772 005702                            TST     R2
 5286 020774 001745                            BEQ     NUDIGIT         ;FITS IN MANTISSA,
 5287 020776 005202                            INC     R2              ;FITS IN MANTISSA BUT AFTER POINT SO
 5288 021000 000743                            BR      NUDIGIT         ;COUNT DECIMAL PLACES,
 5289 021002 122027 000056             NOTDIG: CMPB    (R0)+,#'.
 5290 021006 001024                            BNE     NOTDOT
 5291 021010 005702                            TST     R2
 5292 021012 001003                            BNE     DOTROT
 5293 021014 012702 100000                     MOV     #100000,R2      ;DOT COMES AFTER SHORT NUMBER SO GET
 5294 021020 000733                            BR      NUDIGIT         ;READY TO COUNT DECIMAL PLACES;
 5295 021022 003000                    DOTROT: BGT     DOTIGNO
 5296 021024 122027 000040             DOTIGNO:CMPB    (R0)+,#' 
 5297 021030 001775                            BEQ     .-4
 5298 021032 124027 000060                     CMPB    -(R0),#'0       ;DOT COMES AFTER FULL MANTISSA WITH
 5299 021036 103405                            BLO     PASTDOT         ;TRAILING ZEROES SO IGNORE MORE DIGITS,
 5300 021040 121027 000071                     CMPB    (R0),#'9
 5301 021044 101002                            BHI     PASTDOT
 5302 021046 005200                            INC     R0
 5303 021050 000765                            BR      DOTIGNO
 5304 021052 122027 000056             PASTDOT:CMPB    (R0)+,#'.       ;DOT COMES WHILE IGNORING TRAILING
 5305 021056 001400                            BEQ     DOTBAD          ;AFTER POINT WITH FULL MANTISSA;ERROR,
 5306                                   DOTBAD:
 5307 021060 005046                    NOTDOT: CLR     -(SP)
 5308 021062 124027 000105                     CMPB    -(R0),#'E
 5309 021066 001056                            BNE     NOEXPON         ;NO 'E' AFTER THE NUMBER
 5310 021070 020165 000020                     CMP     R1,LINE(R5)     ;IF ITS THE FIRST THING ON THE LINE IT
 5311 021074 001453                            BEQ     NOEXPON         ;MUST BE A LINENO SO 'E' IS ILLEGAL,
```

```
 5312  021076  005200                      INC     R0
 5313  021100  121027  000040              CMPB    (R0),#BL
 5314  021104  001774                      BEQ     .-6
 5315  021106  122027  000053              CMPB    (R0)+,#'+
 5316  021112  001406                      BEQ     EXPDIG
 5317  021114  124027  000055              CMPB    -(R0),#'-
 5318  021120  001003                      BNE     EXPDIG
 5319  021122  005200                      INC     R0
 5320  021124  012716  100000              MOV     #100000,(SP)
 5321  021130  122027  000040      EXPDIG: CMPB    (R0)+,#BL
 5322  021134  001775                      BEQ     .-4
 5323  021136  124027  000060              CMPB    -(R0),#'0
 5324  021142  103423                      BLO     EXPDUN
 5325  021144  121027  000071              CMPB    (R0),#'9
 5326  021150  101020                      BHI     EXPDUN
 5327  021152  011646                      MOV     (SP),-(SP)
 5328  021154  006316                      ASL     (SP)
 5329  021156  006316                      ASL     (SP)
 5330  021160  066616  000002              ADD     2(SP),(SP)
 5331  021164  006316                      ASL     (SP)
 5332  021166  042766  077777  000002      BIC     #77777,2(SP)
 5333  021174  062616                      ADD     (SP)+,(SP)
 5334  021176  005046                      CLR     -(SP)
 5335  021200  112016                      MOVB    (R0)+,(SP)
 5336  021202  062616                      ADD     (SP)+,(SP)
 5337  021204  162716  000060              SUB     #'0,(SP)
 5338  021210  000747                      BR      EXPDIG
 5339  021212  005716              EXPDUN: TST     (SP)
 5340  021214  002003                      BGE     NOEXPON
 5341  021216  042716  100000              BIC     #100000,(SP)
 5342  021222  005416                      NEG     (SP)
 5343  021224  005702              NOEXPON:TST     R2
 5344  021226  002003                      BGE     EXPOK
 5345  021230  042702  100000              BIC     #100000,R2
 5346  021234  005402                      NEG     R2
 5347  021236  062602              EXPOK:  ADD     (SP)+,R2
 5348  021240  000207                      RTS     PC
 5349
```



```
 5350                                   ;
 5351                                   ; SYSTEM I/O BUFFERS AND HEADERS
 5352                                   ;
 5353
 5354
 5355
 5356                                           .IFNDF  $NOPTP
 5357                                   ;
 5358                                   ; PAPER TAPE READER
 5359                                   ;
 5360  021242  021256              PRBFHD: .       .       PRBUF   ;BSTRT
 5361  021244  021385                      .       .       PRBEND  ;BEND
 5362  021246  021256                      .WORD   .       PRBUF   ;BGET1
 5363  021250  000000                      .       .       0       ;BGET2
 5364  021252  021256                      .WORD   .       PRBUF   ;BPUT
 5365  021254  000000                      .WORD   0               ;BFSPEC
 5366          021256              PRBUF   .=.
 5367          021306                      .=.+$PRBSZ
 5368          021385              PRBEND  .=.+1
 5369                                      .EVEN
 5370                                   ;
 5371                                   ; PAPER TAPE PUNCH
 5372                                   ;
 5373  021306  021322              PPBFHD: .       .       PPBUF   ;BSTRT
 5374  021310  021351                      .       .       PPBEND  ;BEND
 5375  021312  021322                      .WORD   .       PPBUF   ;BGET1
 5376  021314  000000                      .       .       0       ;BGET2
 5377  021316  021322                      .WORD   .       PPBUF   ;BPUT
 5378  021320  000000                      .WORD   0               ;BFSPEC
 5379          021322              PPBUF   .=.
 5380          021352                      .=.+$PPBSZ
 5381          021351              PPBEND  .=.+1
 5382                                      .EVEN
 5383                                      .ENDC
 5384
 5385
 5386                                           .IFNDF  $NOLPT
 5387                                   ;
 5388                                   ; LINE PRINTER
 5389                                   ;
 5390  021352  021366              LPBFHD: .       .       LPBUF   ;BSTRT
 5391  021354  021425                      .       .       LPBEND  ;BEND
 5392  021356  021366                      .WORD   .       LPBUF   ;BGET1
 5393  021360  000000                      .       .       0       ;BGET2
 5394  021362  021366                      .WORD   .       LPBUF   ;BPUT
 5395  021364  000000                      .WORD   0               ;BFSPEC
 5396          021366              LPBUF   .=.
 5397          021426                      .=.+$LPBSZ
 5398          021425              LPBEND  .=.+1
 5399                                      .EVEN
 5400                                      .ENDC
 5401
```

```
5402          021426                  ENDAB   =.
5403          000000'                         .CSECT
5404          000000'                 BEGIN   =.
5405          021426'                 .       =.+ENDAB
5406          000001                          .END
```



```
ADDINT  007430          ADDOVF  007450          ADDPOS  007524          ADDSTK  007370
ADDZER  007510          ADSTK1  017326          ALLEXI  007714          ALLLOO  007600
ALLNOA  007610          ALLOC   007556          ALLOC1  002360          ALLOC2  002432
ALOG    = ****** G      AMATCH  017550          ARGB    011650 G        ARRAYS  = 000010 G
ASSIGN  003222          ATAN    = ****** G      ATNFN   011724          BEGIN   = 000000R
BEND    = 000002        BFSPEC  = 000012        BGET1   = 000004        BGET2   = 000006
BL      = 000040        BOMB    007742          BOMBDO  010014          BOMBJM  010126
BOMBNE  010062          BOMBNX  010002          BOMBOK  010112          BPOL    010636
BPUT    = 000010        BSTRT   = 000000        BUFCLR  010132          BUFEMP  013442
BUFTP   010206          CALL    003012          CALLCK  003070          CALLM1  003100
CALLM2  003122          CALLNM  003174          CALLP   003042          CALLX   003132
CALL1   003030          CALNRM  020654          CALOG   012644          CANFIT  020752
CARRET  020106          CCEXIT  010322          CCMES   007073          CEXP    012656
CHKCHR  010224          CHKISE  010324          CHKOSE  010332          CLEAR   001064
CLMNLP  000402          CLMNPP  000400          CLMNTT  = 000036        CLRECH  006732
CLRFRE  010500          CLRLOO  010442          CLROK   010470          CLRVAR  012424
CNCFLG  = 000106        CNOFLG  = 000107        CODE    = 000016        COLON   005204
COLUMN  = 000034 G      COMCHK  010336          COMES   007076          COMTAB  017502
COS     = ****** G      COSFN   011702          CR      = 000015        CRLFME  007070
DEFDUN  002306          DEFGOT  002550          DELMSG  007060          DEVERR  017044
DIMDON  002602          DIMGOT  002314          DIMLOO  002234          DIMNON  002254
DIMSCL  002462          DIVLOO  010564          DIVTEN  010560          DOALLO  002444
DOCHAR  014404          DOITNO  011400          DOMSG   015526          DOPUT   006562
DOTBAD  021060          DOTIGN  021024          DOTROT  021022          ECHOBA  007052
ECHOSP  = 000104        EDICHG  001410          EDICON  001472          EDIGRO  001556
EDIJMP  001744          EDIMME  001262          EDIMOD  001450          EDIMOV  001502
EDIMVU  001632          EDIOVE  001430          EDIPAS  001340          EDIPUT  001434
EDIRLC  001700          EDIRLO  001736          EDIROO  001620          EDISAM  001660
EDISKI  001274          EDISRC  001300          EDIT    001100          EDITL   001222
END     003254          ENDAB   = 021426        ENDCR   017706          ENDQUO  017660
ENDSQU  017700          EOF     003254          ERADD   011606          ERCHAN  010410
EREXP   011666          ERLOG   007734          ERPD02  011656          ERPD11  011762
ERRAG1  013012          ERRARA  007726          ERRARG  007734 G        ERRDAT  006402
ERRDEE  004040          ERRDEF  002542          ERRDIM  002534          ERRDIV  012230
ERREXP  012516          ERRFN1  003164          ERRFPU  = ****** G      ERRGO   004046
ERRMIX  011650 G        ERRNEX  005144          ERROVR  011606          ERROV1  001614
ERROV2  020344          ERROV3  020550          ERRPDL  011120 G        ERRPD2  011662
ERRPD3  003666          ERRPD4  012670          ERRPD5  011404          ERRRET  004126
ERRRUN  002634          ERRSS1  013742          ERRSS2  011234          ERRSS3  014774
ERRSXA  012674          ERRSX1  003170          ERRSX2  005152          ERRSX3  013736
ERRSX4  011066          ERRSX5  011650          ERRSX6  004094          ERRSX7  003536
ERRSX8  006234          ERRSX9  012122          ERRSYN  011650 G        ERRTRN  020036
ERRTR7  020330          ERRTR8  006242          ERRUFN  013016          ERR4WO  004404
ERSQR   007734          ERSTAR  011666          ERSX10  004506          ERSX12  010404
EVAL    010616 G        EXECUT  002654          EXIT02  007104          EXP     = ****** G
EXPDIG  021130          EXPDUN  021212          EXPFN   011732          EXPNEG  020402
EXPOK   021236          EXPTEN  020360          FAC1    = 000040 G      FAC2    = 000042 G
FF      = 000014        FILLCH  = 000112        FILLCO  = 000110 G      FILLNO  = 000111
FIXCLZ  013250          FIXRET  013252          FIXTST  013230          FIXUP   013174
FLE     013276          FLINE   013254          FLIT    011032          FLX     013302
FNCHK   013162          FNFN    012700          FNNOCO  013024          FNNUME  013170
FNRCOM  013144          FNREPL  013000          FNRLUP  013100          FNRSNU  013160
FNRSSC  013132          FNSWAP  012724          FOR     004134          FORGO   004622
FORGOG  004620          FORGTL  004560          FORLOO  004312          FORLTL  004572
FORNEX  004412          FORNOL  004336          FORONE  004276          FORSKI  004306
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FORGER  004576        FOUNDL  020636        FOUNDV  020222        FPPRES  013306
FPPSAV  013334        FRSTOU  015532        FUNCTI  011706        FUNOK   012024
FUNRET  012056        GCWAIT  013570        GETBYT  013374        GETCHA  013450
GETCHI  013452        GETVAR  013604 G      GETX    013466        GET1BY  013362
GET2BY  013370        GOEXEC  006214        GONOSA  004432        GOSUB   003754
GOTECH  006770        GOTO    003754        GOTOFN  011126        GOTONE  014414
GSBCTR = 000032       HORSTU  016740        HIFREE = 000012       HISTR  = 000074
IDEV   = 000077       IF      003316        IFCOMP  003542        IFLEND  003458
IFLEOR  003472        IFLGTR  003676        IFLLTR  003622        IFLOOP  003420
IFNUME  003552        IFSEQ   003466        IFSGT   003672        IGNORE  002650
ILITCO  011042        ILIT1   011004        ILIT2   011024        IMMED   001750
IMMSTM  002032        INITBF  013746        INITSC  013704        INPEND  006170
INPEOL  006240        INPGOO  006162        INPLOO  005736        INPNEW  005764
INPNGU  006220        INPOK   006104        INPPC   005732        INPRTR  005754
INPSTO  006136        INPUT   005650        INPYES  005672        INPYS1  005730
INT     014004 G      INTEXT  017122        INTFN   012100        INTRTS  014136
INT1    014074        INT1A   014106        INT1B   014124        INT2    014126
INT2A   014132        INT5    014140        INT6    014100        INT7    014220
INT8    014232        INT9    014242        IOINIT  001154        IOWAIT  014312
ISLNO   020602        ISNUM   020310        ISVAR   020110        ITAB    013600
ITABLE  016421        ITSIN   017000        JMPRDY  003312        KBCO    006942
KBHD   = 000102       KBIDUN  006626        KBINT   006470        KEYA    000476
KEYWDS  000484        LET     003210        LEVFLT  014542        LEVFNE  014604
LEVLIT  014516        LEVPLU  014514        LEVPOS  014612        LEV1LT  014560
LEV2LT  014554        LF     = 000012       LIMIT  = 000002 G      LINA    014350
LINDUN  015540        LINE   = 000020       LINEIN  014370        LINENO = 000030
LINGET  014344        LINRUB  014374        LIST    002200        LISTSV  002170
LITCOM  020516        LITDIV  015664        LITEVA  014464        LITNOR  015574
LITOK   015622        LITSHR  015674        LITSTO  015700        LITTST  015612
LITZER  020504        LNOSRC  020560        LOCALO  014634        LOCGET  014620
LOCLOO  014730        LOCNO2  014756        LOCSS1  014666        LOFREE = 000014
LOGFN   011746        LOSTR  = 000072       LPAR    011654        LPR    = 177516
LPBEND = 021425       LPBFHD  021352        LPBUF  = 021306        LPERR   007314
LPINT   007256        LPOFF   007322        LPS    = 177514        LSTBSL  015174
LSTCHA  015200        LSTCHK  015074        LSTCRL  015142        LSTEOL  015130
LSTFLB  015306        LSTFLI  015266        LSTFN   015110        LSTILB  015200
LSTIL1  015236        LSTIL2  015250        LSTJMP  015312        LSTKWD  015062
LSTLIN  015154        LSTLNO  015350        LSTLNX  015400        LSTLOO  015006
LSTNEX  015122        LSTPC   015044        LSTPRO  015002        LSTPTR  015316
LSTSPE  015206        LSTSRC  015050        LSTTEX  015224        LSTVAR  015412
MAKE12  020512        MAKEOK  020530        MAKEST  011650 G      MAKFLI  020644
MAKLNO  020554        MINUS   011470        MPYTEN  015436        MSG     015474 G
MSGCOM  015476        MSGERR  015466        MSGODE  015522        MSGSUP  006746
NEXEND  005070        NEXFIL  020012        NEXGO   005106        NEXGTL  005052
NEXLTL  005062        NEXT    004644        NOCHAR  013472        NOCHR2  007250
NOCNC   002672        NODIGI  020150        NOEXPO  021224        NOOM    006000
NOQM1   006014        NOQUOT  010716        NORM    015554 G      NORNDO  016310
NOROOM  016670        NOSUBS  013734        NOTDIG  021002        NOTDOT  021060
NOTIT   020204        NOTKWD  020042        NOTNOW  011434        NOTSYM  002770
NOWRAP  016636        NOWRP   013434        NUDIGI  020710        NUMALN  016240
NUMBIG  016222        NUMDIG  016314        NUMDIV  016230        NUMEXI  016576
NUMFIX  016024        NUMFLT  016122        NUMFM1  016376        NUMFM2  016504
NUMFM3  016520        NUMJMP  017452        NUMLP1  016414        NUMLP3  016554
NUMNEG  016052        NUMNOR  016154        NUMOK   016240        NUMOUT  015746 G
NUMPOS  016060        NUMPRS  016064        NUMSGN  015700 G      NUMSHF  016146
```



```
NUMSTT  016066        ODEV   = 000076       OFFTYP  006700        OLD     002100
OLD001  002136        OPERAN  010640        OPRATO  011272 G      OPRFN   012116
OTABLE  010416        OUT010  017024        OUT012  010402        PASTDO  021052
PC     =%000007       POL    = 000004 G     PDSIZE = 000006 G     PLUS    011534
PNDGO   017146        POP     014270        POWDWN  007330        POWLP   007342
POWUP   007340        PPB    = 177556       PPBEND = 021351        PPBFHD  021306
PPBUF  = 021322       PPERR   007242        PPINT   007204        PPS    = 177554
PRB    = 177552       PRBEND = 021305       PRBFHD  021242        PRBUF  = 021256
PREC2   011372        PREC3   011364        PREC4   011356        PREC5   011350
PREOT   007174        PRIBOT  005334        PRICM   005326        PRICOM  005356
PRIJMP  005452        PRIMOR  005350        PRINCR  005632        PRINT   005156
PRISEM  005434        PRISJ   005504        PRISTR  005476        PRIST1  005506
PRITB   005550        PRITB0  005600        PRITB1  005614        PRITES  005444
PRNTDE  007036        PRNT01  005220        PRS    = 177550       PRS     = 000140
PR4    = 000200       PR7    = 000340       PS     = 177776       PTRINT  007104
PUSH    014256        PUSHF   011634        PUSH1   014302        PUTBYT  016004
PUTCCD  016724        PUTCHA  016676        PUTIT   016754        PUTITI  020230
QUOTPA  017614        READ    006246        READBA  006410        READOU  006332
READGO  006314        READOU  006376        READY   001076        READY0  001072
READY2  001140        REAFIN  006426        REASRC  006422        REENAB  013946
REMPAC  020064        RESREG  017104        RESTOR  003742        RETLNO  020266
RETRY   017510        RETURN  004060        RETVAR  020202        REVRSE  012622
RNDCT  = 000070       RNDGOT  002506        RND1   = 000004 G     RND2   = 300000 G
RUN     002224        R0     =%000000       R0SAVE = 000044       R1     =%000001
R1SAVE = 000046       R2     =%000002       R2SAVE = 000050       R3     =%000003
R3SAVE = 000052       R4     =%000004       R4SAVE = 000054       R5     =%000005
SAVCHA  011650 G      SAVE    002142        SAVREG  017002        SAVRGI  017052
SCANPN  017124        SCRATC  001054        SETLFE  007044        SIN    = ****** G
SINFN   011674        SKIPEO  017160        SKIPHI  017224        SKIPRT  017242
SKIPTX  017234        SKIP01  017156        SKIP02  017194        SKIP05  017150
SLASH   011572        SQPRAT  011650 G      SP     =%000006       SPARE  = 000113
SPECME  006702        SQRFN   011710        SQRT   = ****** G     SS1SAV = 000024
SS2SAV = 000026       STAR    011542        START   001034 G      STAR1   011566
STOCOM  017300        STOLNO  020614        STONOS  017270        STOP    003276
STOSTR  017642        STOSVA  011650        STOTXT  020074        STOVAR  017244 G
STPRO   011650 G      SUBINT  017332        SUBSTK  017312        SYMBOL = 000000
S.0101  006604        S.0102  006622        TAB    = 000011       TABLE1  002716
TABLE2  011416        TABLE4  002016        TABLE5  010756 G      TABL5  = 005320
TAB1    017030        TAB2    017036        TAB3    014460        TBL1EN  002766
TBL4EN  002030        TBL5EN = 011002 G     TERMIN  011400        TKB    = 177562
TKS    = 177560 G     TPB    = 177566 G     TPCN    007006        TPCO    007022
TPHD   = 000100       TPINT   006642        TPNXT   006670        TPS    = 177564
TRAN    017354        TRANLU  017402        TRANVA  017466        TRENRA  017772
TRNER4  020544        TRNFN   017734        TRNPC   017504        TRYAGN  017506
TRYECH  006734        TRYKWD  017456        TRYNUM  017430        TSTSTK  011620
TSTS1   011624        TSTS2   011632        TYPE    006710        TYPE1   006724
T1     = 000056 G     T2     = 000060 G     T3     = 000062 G     UAASR   012524
UAJMP   012536        UATSTA  012502        UATST0  012542
UATST2  012552        UA1     012152        UA10    012202        UA10A   012320
UA10B   012342        UA10C   012352        UA10.5  012304        UA12    012402
UA17    012412        UA17A   012424        UA17B   012442        UA17D   012452
UA17F   012472        UA19    012510        UA20    012570        UA21    012516
UA23    012600        UA4     012202        UA5     012210        UAR     012222
UA9     012250        UINTEG  011512        UMINUS  010630        UNARY   011474
UPARRO  012126        USRARE = ****** G     VAL     020702 G      VARBLE  011072
```

```
VARNOS  011262          VARSAV = 000022          VARSRC  020162          VARSS   011132
VERNUM  000040          VONESS  011240          VTWOSS  011252          WTRET   014330
XCHAR   013510          $ADR   = ******  G       $DVR   = ******  G      %ERVEC = ******  G
$IR    = ******  G      $LPBSZ = 000040          $MLR   = ******  G      %NOSTR = 000001
$POLSH = ******  G      $PPBSZ = 000030          $PRBSZ = 000030         %PPORG = 000400
$SBR   = ******  G      $STKSZ = 000200  G       ,ABS   = 000273         ,AMPER = 000226
,ATN   = 000270         ,CALL  = 000224          ,CLEAR = 000304         ,COLON = 000260
,COMMA = 000243  G      ,COS   = 000266          ,DATA  = 000223         ,DEF   = 000221
,DIM   = 000215         ,DQUOT = 000256          ,EG    = 000247         ,EL    = 000245
,EN    = 000251         ,END   = 000202          ,EOF   = 000225         ,EOL   = 000201  G
,EQ    = 000254         ,EXP   = 000271          ,FLIT  = 000374         ,FN    = 000262
,FOR   = 000203         ,GE    = 000246          ,GOSUB = 000204         ,GOTO  = 000205
,GT    = 000253         ,IF    = 000206          ,ILIT1 = 000375         ,ILIT2 = 000376
,INPUT = 000207         ,INT   = 000274          ,LE    = 000244         ,LET   = 000210
,LIST  = 000277         ,LOG   = 000272          ,LPAR  = 000255  G      ,LT    = 000252
,MINUS = 000234         ,NE    = 000250          ,NEXT  = 000211         ,NVAR  = 177776
,OLD   = 000302         ,PLUS  = 000232          ,POUND = 000201         ,PRINT = 000212
,RANDO = 000216         ,READ  = 000222          ,REM   = 000220         ,RESTO = 000217
,RETUR = 000213         ,RND   = 000264          ,RNDL  = 000203         ,RPAR  = 000237  G
,RUN   = 000300         ,SAVE  = 000301          ,SCALA = 177775         ,SCR   = 000303
,SEMI  = 000236         ,SGN   = 000275          ,SIN   = 000265         ,SLASH = 000231
,SQR   = 000267         ,SQUOT = 000257          ,STAR  = 000230         ,STEP  = 000241
,STOP  = 000214         ,SVAR  = 177777          ,TAB   = 000276         ,TERM  = 000235
,TEXT  = 000377         ,THEN  = 000242          ,TO    = 000240         ,UNARY = 000233
,UPARR = 000227         .      = 021426R
```

ERRORS DETECTED: 0

RUN-TIME: 72 SECONDS
CORE USED: 4K

ADDINT 2231 2240#
ADDOVF 2243 2246#
ADDPOS 2246 2259#
ADDSTK 1562 2229# 2973 4837
ADDZER 2247 2256#
ADSTK1 4837# 4839 4842
ALLEXI 2351#
ALLLOO 2284# 2291
ALLNOA 2285 2288#
ALLOC 972 2276# 4030
ALLOC1 941 947#
ALLOC2 957 963#
ALOG 63 3186 3397
AMATCH 4890 4901#
ARGB 79 3003#
ARRAYS 72 314# 315 2627 2629
ASSIGN 1073 1163#
ATAN 63 3181
ATNFN 2787 3181#
BEGIN 5404#
BEND 358# 3667 4576
BFSPEC 362# 2031 2033 2142 2146 2165 2185 3692 3696 3698 3737 4624 4626 4629
BGET1 359# 3656 4579
BGET2 360# 3658 4581
BL 298# 1238 1245 1670 1736 4174 4412 4864 4893 4896 4943 4986 4996 5266
5296 5313 5321
BOM# 211 2403#
BOMBOO 2417 2420#
BOMBJM 2421 2441#
BOMBNE 2427 2431#
BOMBNX 2416# 2419
BOMBOK 2430 2437#
BPOL 2740 2745#
BPUT 361# 3663 4574 4583 4584
BSTRT 357# 3669 4578
BUFCLR 643 653 2022 2450#
BUFEMP 3664 3673#
BUFTP 2028 2456 2479#
CALL 1067 1080#
CALL1 1095 1098#
CALLCK 1116# 1155
CALLM1 1121# 1124
CALLM2 1130# 1133
CALLNM 1122 1131 1151#
CALLP 1102# 1104
CALLX 1129 1135#
CALNRM 5181 5184#
CALOG 3382 3397#
CANFIT 5273 5279#
CARRET 4979 4982#
CCEXIT 2501 2503 2505 2507 2510 2513 2515 2518 2520 2522#
CCMES 2096 2115#
CEXP 3385 3399#

CHKCHR 2088 2500# 3940
CHKISE 885 1768 2938#
CHKOSE 893 1605 2540#
CLEAR 646# 868
CLMNLP 367# 877 1015 1648
CLMNPP 366# 876 1014 1647
CLMNTT 325# 326 657 875 1013 1701 1840 2407 4298
CLRECH 2070 2077#
CLRFRE 2605 2627#
CLRLOO 2604# 2625
CLROK 2607 2624#
CLRVAR 646 883 912 2601#
CNCFLG 348# 349 655 1036 1038 2021 3903 4607
CNOFLG 349# 350 2026 4296 4612
CODE 317# 318 682 697 870 913 1017 1186 1750 1807 1947 3809 3946 4085
4859
COLONC 1607 1609#
COLUMN 76 324# 325 657 658 1608 1635 1677 1771 1782 1716 1729 1745 2407
2408 4297 4298 4299 4301 4309 4600
COMCHK 2539 2541#
COMES 2100 2117#
COMTAB 4880 4882 4884#
COS 63 3176
COSFN 2785 3176#
CR 297# 660 666 1189 1195 1742 1803 1855 2410 2439 2529 3949 3956 4122
4857 4866 4923 4978
CRLFME 2106 2114#
DEFDUN 930# 1012
DEFGOT 924 1003#
DELMSG 2103 2112#
DEVERR 684 4625 4630 4659#
DIMDON 928 1013#
DIMGOT 922 932# 974
DIMLOO 914# 931 978 983
DIMNON 915 921#
DIMSCL 969 972#
DIVLOO 2648# 2654
DIVTEN 2647# 4349 4454
DOALLO 951 967#
DOCHAR 3934 3936# 3944 3947
DOITNO 2918 2920 2925 2940#
DOMSG 4302# 4305
DOPUT 2023 2025 2027 2029#
DOTBAD 5305 5306#
DOTIGN 5295 5296# 5303
DOTNOT 5292 5295#
ECHOBA 2091 2109#
ECHOSP 347# 348 642 2065
EDICHG 735# 742
EDICON 758#
EDIGRO 756 781#
EDIJMP 827 840#
EDIMME 691 696 703#

EDIMOD 749# 754
EDIMOV 762# 764
EDIMVV 808# 810
EDIOVE 723 743#
EDIPAS 721# 725 731
EDIPUT 709 720 745#
EDIRLC 826# 839
EDIRLO 829 835 838#
EDIROO 805#
EDISAM 757 780 819#
EDISKI 706# 711 717 719
EDISRC 699 702 707#
EDIT 680# 704 840 889 1192
EDITL 681 685#
END 1049 1185#
ENDAB 5402# 5405
ENDCR 4924 4935#
ENDQUO 4922 4927#
ENDSQU 4930 4933#
EOF 1068 1186#
ERADD 2232 3163#
ERCHAN 2544 2550 2553 2559#
EREXP 3161# 3184
ERLOG 2383# 3187
ERPD02 3050#
ERPD11 3194#
ERR4WO 1449 1463#
ERRAG1 3425 3487# 3498 3501 3503
ERRARA 2287 2289 2294 2302 2305 2387 2359#
ERRARG 73 2384# 3487
ERRDAT 1791 1896 1928#
ERRDEE 1336 1341#
ERRDEF 994# 1004 1008 1010
ERRDIM 933 938 943 945 953 959 961 966 968 971 976 9A5#
ERRDIV 2983 3279#
ERREXP 3257 3349#
ERRFN1 1108 1113 1117 1128 1137 1148#
ERRFPU 82 259
ERRGO 1329 1350#
ERRMIX 73 3007#
ERRNEX 1530 1532 1541 1543 1545 1590#
ERROV1 793#
ERROV2 793 5044 5089# 5145
ERROV3 5145# 5174
ERROVR 3164# 3283
ERRPD2 3050 3147# 3194
ERRPD3 1209 1273 1299#
ERRPD4 3401# 3413 3439
ERRPD5 2955 2962#
ERRPDL 73 1299 2745 2853# 2869 2962 3147 3401
ERRRET 1366 1372 1380#
ERRRUN 1020#
ERRSS1 3749 3751 3765 3767 3777#

ERRSS2 2879 2893 2897 2900# 2904 3777
ERRSS3 2900 4035 4039 4041 4067#
ERRSX1 1045 1097 1099 1186 1149# 1159 1165 1173 1205 1207
ERRSX2 1535 1548 1599# 1612 1709 1715
ERRSX3 3756 3769 3771#
ERRSX4 2775 2825# 2883 2895 2922
ERRSX5 888 1263 1359 1507 1599 1859 2557 2825 3012# 3243 3407 3771 4720
ERRSX6 1291 1311 1325 1327 1359# 1363 1394 1399 1401 1412 1426 1434
ERRSX7 1255 1263# 1269 1271
ERRSX8 1770 1774 1842 1859# 1890 1925
ERRSX9 3207 3240 3243#
ERRSXA 3407# 3410 3512
ERRSYN 73 984 1149 3011#
ERRTR7 4968 5079#
ERRTR8 1808 1886#
ERRTRN 872 1886 4920 4958 4961 4966 4968# 4977 5070 5144
ERRUFN 1148 2780 3205 3415 3488#
ERSQR 2382# 3179
ERSTAR 2975 3162# 3281
ERSX10 1482 1507#
ERSX12 2542 2557#
EVAL 75 1166 1202 1211 1277 1403 1413 1427 1500 1629 1724 2541 2739# 2817
2871 2885 3195 3233 3417 3506 3741 3757
EXECUT 878 1019 1036# 1048 1075 1175 1320 1340 1374 1514 1581 1704 1847 1926
EXIT02 2135 2137 2139 2141 2144#
EXP 63 3183 3399
EXPDIG 5316 5318 5321# 5338
EXPDUN 5324 5326 5339#
EXPFN 2788 3183#
EXPNEG 5102 5106#
EXPOK 5344 5347#
EXPTEN 5076 5099# 5105
FAC1 76 326# 327 1275 1419 1421 1490 1491 1495 1552 1564 1585 1826 2238
2252 2253 2254 2257 2262 2263 2264 2429 2434 2435 2436 2543 2806 2810
2812 2813 2878 2892 2914 2956 2964 2966 2970 2997 3225 3258 3284 3291
3305 3308 3318 3441 3583 3591 3748 3764 3819 3843 3851 3862 3878 3883
3885 3974 3990 3991 3996 4000 4149 4151 4152 4165 4170 4171 4172 4391
4394 4402 4418 4778
FAC2 76 327# 328 1274 1420 1422 1492 1493 1497 1553 1563 1586 1728 1827
2242 2244 2249 2250 2256 2259 2260 2428 2431 2432 2545 2807 2808 2814
2815 2884 2896 2903 2915 2953 2968 2971 2996 3226 3260 3262 3268 3285
3289 3309 3323 3443 3585 3750 3768 3833 3850 3860 3861 3874 3876 3879
3882 3886 3975 3992 3993 3998 4144 4145 4147 4148 4153 4154 4164 4167
4168 4396 4398 4400 4403 4416 4779
FF 296# 897
FILLCH 352# 353 2072
FILLCO 71 350# 351 2060 2062 2074
FILLNO 351# 352 2074
FIXCLE 3590 3597#
FIXRET 3584 3592 3598#
FIXTST 3582 3591#
FIXUP 2230 3580#
FLE 3607 3614#

FLINE 904 1324 3606#
FLIT 2753 2812#
FLX 3613 3616#
FNCHK 3530 3555#
FNFN 2862 3408#
FNNOCO 3484 3497#
FNNUME 3568#
FNRCOM 3548#
FNREPL 3444 3483#
FNRLUP 3515# 3556
FNRSNU 3549 3554#
FNRSSC 3531#
FNSWAP 3416# 3486
FOR 1050 1391#
FORGO 1505 1509 1516#
FORGOG 1502 1515#
FORGTL 1504#
FORLOO 1437 1439#
FORLTL 1503 1508#
FORNEX 1451 1472#
FORNOL 1448 1446 1448#
FORONE 1424 1435#
FORSKI 1438# 1453 1456 1462 1474 1488
FORZER 1506 1518#
FOUNDL 5155 5178#
FOUNDV 5026#
FPPRES 2237 2981 2989 3211 3255 3346 3380 3589 3596 3623#
FPPSAV 2233 2976 2984 3208 3253 3314 3329 3377 3586 3594 3635#
FRSTOU 4308 4304#
FUNCTI 3175 3177 3180 3182 3185 3188 3195#
FUNOK 3210 3213# 3398 3408
FUNRET 3215 3222#
GCWAIT 3714 3716#
GET1BY 2161 2180 3656# 3690
GET2BY 2080 2083 3658#
GETBYT 3657 3659#
GETCHI 3698# 3718
GETCHA 3689# 3936
GETVAR 75 1163 1778 1894 3734#
GETX 3694# 3700 3710
GOEXEC 1845 1847#
GONOSA 1331 1339#
GOSUB 1851 1323#
GOTECH 2881 2888#
GOTO 1852 1297 1259 1261 1293 1295 1297 1313 1315 1317 1324#
GOTOFN 2761 2802#
GOTONE 3937 3939#
GSBCTR 323# 324 734 748 1332 1338 1364 1368 2632
HORSTU 4611 4614#
HIFREE 315# 316 791 2383 2311 2351 2629 5043 5173
HISTR 340# 343 2306 2631
IDEV 344# 703 1763 1844 2584 3788 3712 3926
IF 1853 1202#

IFCOMP 1233 1239 1246 1264#
IFLEND 1235 1243#
IFLEQR 1251# 1285
IFLGTR 1286 1307#
IFLLTR 1267 1287#
IFLOOP 1232# 1237
IFNUME 1203 1268#
IFSEQ 1242 1244 1249#
IFSGT 1264 1305#
IGNORE 1035# 1060 1061 1063 1064 1066 1147 1262 1298 1318 1520 1589
ILIT1 2749 2806#
ILIT2 2751 2810#
ILITCO 2811 2814#
IMMED 705 850#
IMMSTM 859 869#
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INITSC 645 882 3809#
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INPEOL 1772 1885#
INPGOO 1836 1839#
INPLOO 1773# 1840
INPNEW 1782# 1858
INPNGU 1831 1838 1848#
INPOK 1781 1818#
INPPC 1772#
INPRTR 1779# 1817
INPSTO 1829 1832#
INPUT 1054 1750#
INPY01 1765 1771#
INPYES 1751 1762#
INT 77 1725 2877 2891 3241 3747 3763 3819#
INT1 3839# 3842
INT1A 3838 3843#
INT1B 3846 3849#
INT2 3844 3850#
INT2A 3851# 3875 3877
INT5 3830 3854# 3859
INT6 3855 3860#
INT7 3825 3872#
INT8 3873 3876#
INT9 3848 3878#
INTEXT 4684 4701#
INTFN 2791 3233#
INTRTS 3820 3827 3852# 3863 3865 3871 3888
IOINIT 669#
IOWAIT 3717 3902# 4621
ISLNO 5151 5154#
ISNUM 4876 5072#
ISVAR 4974 4985#
ITAB 3709 3713 3715 3721#
ITABLE 2538 2584#
ITSIN 4620 4626#
JMPROY 1187 1199#

KBCO 2020 2024#
KBHD 346# 347 2014 2078 2450 3962
KBIDUN 2018 2030 2041#
KBINT 237 2012#
KEYA 519# 4883
KEYWDS 467# 4097 4878
LET 1055 1158#
LEV1LT 3983 3993#
LEV2LT 3987 3992#
LEVFLT 3985 3989#
LEVFNE 3997 4000#
LEVLIT 3979 3982#
LEVPLU 3977 3981#
LEVPOS 3995 3999 4001#
LF 295# 660 666 1189 1195 1742 1859 2138 2410 2439 3949 3956 4122
LIMIT 72 311# 312 1335 2636
LINA 3926# 3941
LINDUN 4303 4306#
LINE 318# 319 688 819 853 1802 1810 1816 3932 3933 4855 5111 5310
LINEIN 3929 3932# 3959
LINENO 322# 323 874 919 1074 1436 1510 2420 2426 4716
LINGET 680 1789 3925#
LINRUB 3933# 3943
LIST 863 903#
LISTSV 895 899# 905 907
LITCOM 5134# 5192
LITDIV 4336 4349#
LITEVA 1830 1912 3973#
LITNOR 4320 4324# 4329 4331 4348 4351
LITOK 4325 4334#
LITSHR 4352# 4355
LITSTO 4335 4354#
LITTST 4319 4330#
LITZER 5131# 5183
LNOSRC 5148# 5153 5157
LOCALO 4015 4018#
LOCGET 2913 4014# 4773
LOCLOO 4046# 4051
LOCNO2 4037 4055#
LOCSS1 4017 4034#
LOFREE 316# 317 773 775 798 805 806 1529 2604 2630 2631 3812 4999 5045
5148 5175
LOGFN 2789 3186#
LOSTR 339# 340 2030
LPAR 2755 2817#
LPB 290# 2182
LPBEND 5391 5398#
LPBFHD 2177 2465 4046 5390#
LPBUF 5390 5392 5394 5396#
LPERR 2179 2185#
LPINT 251 2175#
LPOFF 2181 2186#
LPS 289# 2178 2186 4657

LSTBSL 4120 4132#
LSTCHA 4114 4133# 4175
LSTCHK 4104 4107#
LSTCRL 4121# 4131
LSTEOL 4089 4117#
LSTFLB 4130 4155#
LSTFLI 4136 4151#
LSTFN 4111#
LSTIL1 4138 4144#
LSTIL2 4139 4147#
LSTILB 4146 4149#
LSTJMP 4156# 4183
LSTKWD 4103# 4106
LSTLIN 4118 4125#
LSTLNO 4163 4167#
LSTLNX 4166 4173#
LSTLOO 908 4086# 4110 4116 4124 4134 4141 4156
LSTNEX 4108 4115#
LSTPC 4097#
LSTPRO 899 4085#
LSTPTR 4087 4157#
LSTSPE 4094 4135#
LSTSRC 4098# 4102
LSTTEX 4140# 4143
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	3248	3250	3252	3263	3266	3312	3372	3376	3388	3389	3390	3391	3392	3393
	3394	3395	3412	3416	3423	3438	3440	3442	3499	3504	3510	3513	3514	3515
	3516	3517	3528	3529	3531	3532	3554	3580	3581	3585	3593	3627	3639	3660
	3670	3673	3689	3694	3701	3786	3882	3883	3885	3886	3888	3889	4001	4018
	4019	4020	4027	4031	4032	4033	4042	4043	4044	4045	4047	4049	4050	4052
	4053	4262	4263	4268	4270	4297	4301	4309	4317	4323	4328	4332	4345	4356
	4358	4359	4361	4362	4363	4387	4388	4473	4474	4475	4476	4477	4478	4479
	4484	4523	4543	4572	4585	4588	4605	4622	4671	4683	4684	4685	4686	4687
	4688	4689	4690	4691	4692	4693	4694	4695	4696	4697	4698	4834	4836	4838
	4840	4841	5073	5077	5140	5178	5280	5281	5282	5283	5307	5320	5327	5328
	5329	5330	5331	5332	5333	5334	5335	5336	5337	5339	5341	5342	5347	
SPARE	353#													
SPECME	2069#	2097	2101	2104	2107									
SQRFN	2786	3178#												
SQRT	63	3178												
SS1SAV	320#	321	1409	1419	1486	1487	1499	1587	3736	3750	4770			
SS2SAV	321#	322	1420	1488	1489	1498	1559	1561	1572	1575	3737	3766	4772	
STAR	2947	2975#												
STAR1	2982#	2990												
START	69	203	640#											
STOCOM	4774	4776	4778#											
STOLNO	5149	5158#												
STONOS	4771	4775#												
STOP	1059	1194#												
STOSTR	4921#	4926												
STOSVA	3006#													
STOTXT	4978#	4981												
STOVAR	75	1174	1410	1588	1833	1915	4764#							
STPRO	79	3008#												
SUBINT	4835	4838#												
SUBSTK	1284	1501	1569	2963	4834#									
SYMBOL	310#	311												
S,0101	2032	2035#	2036											
S,0102	2039#	2040												
T1	78	333#	334	4863	4973	5063								
T2	78	334#	335											
T3	78	335#	336	1762	1766	1782								
TAB	294#													
TAB1	4614	4637#												
TAB2	4627	4655#												
TAB3	3927	3961#												
TABL5	1608	1646#												
TABLE1	1044	1048#	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060
	1061	1062	1063	1064	1065	1066	1067	1068						
TABLE2	2946#	2947	2948	2949	2950	2951	2952							
TABLE4	858	863#	864	865	866	867	868							
TABLE5	74	2774	2782#	2784	2785	2786	2787	2788	2789	2791				
TBL1EN	1044	1068#												
TBL4EN	858	868#												

TBL5EN	74	2774	2805#											
TERMIN	2952	2960#												
TKB	282#	2016												
TKS	68	281#	2041	3721										
TPB	68	284#	2038	2075										
TPCN	2092	2094#												
TPCO	2095	2098#												
TPHO	345#	346	2082	2479	4637									
TPINT	239	2058#												
TPNXT	2061	2065#												
TPS	283#	2015	2085	4655										
TRAN	685	1813	4855#											
TRANLU	4863#	4913	4932	4934	4953	4967	5143							
TRANVA	4864#	4865	5071											
TRFNBA	4946	4948	4954#											
TRNER4	5136	5142	5144#	5188										
TRNFN	4907	4943#												
TRNPC	4878	4883	4885#											
TRYAGN	4886#	4900												
TRYECM	2068	2078#	2099											
TRYKWD	4873	4875	4878#											
TRYNUM	4867	4870#												
TSTS1	2993#	2998												
TSTS2	2992	2995#												
TSTSTK	2977	2985	2991#											
TYPE	2072#	2084	2093	2110										
TYPE1	2064	2073	2075#											
UA1	3249	3251	3257#											
UA10	3259	3289#												
UA10A	3298#	3304												
UA10B	3299	3305#												
UA10C	3306	3308#												
UA10,5	3290	3295	3300	3302	3312#									
UA12	3313	3318#												
UA17	3267	3323#												
UA17A	3325	3327#												
UA17B	3332#	3339												
UA17D	3332	3335#												
UA17F	3335	3340#												
UA19	3341	3346#												
UA20	3328	3376#												
UA21	3350#	3373												
UA23	3316	3379#												
UA4	3263#	3286												
UA5	3261	3266#	3310											
UA8	3270#	3280	3282	3320										
UA9	3269	3284#	3319											
UAASR	3332	3360#												
UAJMP	3316	3339	3361	3364#	3367	3370								
UANJMP	3362#	3368	3371											
UATST0	3335	3366#												
UATST2	3341	3369#												
UATSTA	3372#	3381												

UINTEG 2965 2968#
UMINUS 2743# 2757
UNARY 2958 2964#
UPARRO 2946 3248#
USRARE 70 640 2013 2059 2157 2176 2199 2404
VAL 80 5074 5262#
VARBLE 2747 2833#
VARNOS 2845 2847 2914#
VARSAV 319# 320 1402 1461 1479 1546 1793 1818 3734 4763
VARSRC 4999# 5004 5013 5015
VARSS 2837 2868#
VERNUM 231#
VONESS 2881 2901#
VTWOSS 2899 2904#
WIRET 3904 3906#
XCHAR 3693 3701#
' 202# 204# 205 206# 207 208# 209 210# 213# 223# 224 225# 226 230#
236# 238# 240# 243# 249# 256# 257 258# 261# 736 738 744 752 766
769 774 776 779 783 792 807 815 818 822 825 871 1223 1227
1231 1241 1248 1253 1289 1309 1490 1550 1560 1636 1646 1681 1717 1804
1811 1918 1949 2281 2309 2312 2628 2637 2649 2779 2805 3204 3436 3507
3509 3526 3704 3907 4028 4048 4091 4100 4179 4357 4360 4504 4510 4512
4525 4527 4529 4535 4858 4862 4899 4915 4939 4944 4987 4997 5267 5297
5314 5322 5366 5367# 5368 5379 5380# 5381 5396 5397# 5398 5402 5404 5405#
,ABS 431# 432 573
,AMPER 394# 395 484
,ATN 428# 429 567
,CALL 392# 393 553 5119
,CLEAR 455# 619
,COLON 420# 421 512 1611 1769
,COMMA 78 407# 408 488 952 973 1614 1675 1828 1835 1839 1901 1919 1922
2882 3483 3755
,COS 426# 427 563
,DATA 391# 392 551 1951
,DEF 389# 390 547 923
,DIM 385# 386 599 921
,DQUOT 418# 419 508 1096 1623 4912 4931
,EG 411# 412
,EL 409# 410
,EN 413# 414
,END 374# 375 607
,EOF 393# 394 602 708 722 826 873 927 1018 1448 1953 3810 4090 4119
,EOL 78 373# 374 482 886 975 982 1172 1326 1362 1423 1433 1481 1609
1617 1671 1698 1714 1780 1837 1841 1885 1899 1917 1924 2917 3911 4008
4738 4868 4936 4983
,EQ 416# 417 506 1164 1206 1260 1270 1400 1544 2930 2932 3502
,EXP 429# 430 569
,FLIT 456# 2752 3984 4093 4135 4735 5185
,FN 422# 423 555 1003 2760 4109 4740 4906
,FOR 375# 376 527 1452 1531
,GE 410# 411 494 496 1258 1312
,GOSUB 376# 377 537 1330 5115
,GOTO 377# 378 525 1254 1290 1310 2919 5117

,GT 415# 416 504 1314
,IF 378# 379 523
,ILIT1 457# 940 956 2748 3982 5131
,ILIT2 458# 942 998 2750 3986 4137 4747 5133
,INPUT 379# 388 541
,INT 432# 433 575
,LE 408# 409 490 492 1204 1256 1268 1292
,LET 380# 381 521
,LIST 448# 451 609 856 5123
,LOG 430# 431 571
,LPAR 76 417# 418 478 516 937 1009 2754 2836 3409 3555 3738
,LT 414# 415 502 1294
,MINUS 400# 401 470 2756 2928 2934 3978
,NE 412# 413 498 500 1296 1316
,NEXT 381# 382 531 1450 4107 4742 4908
,NVAR 304# 967 2328
,OLD 453# 454 615
,PLUS 398# 399 468 2758 3976
,POUND 421# 422 514 1602 1764 4718
,PRINT 382# 383 543
,RANDO 386# 387 601 925
,READ 390# 391 549
,REM 388# 389 545 4904
,RESTO 387# 388 603
,RETUR 383# 384 539
,RND 424# 425 559
,RNDL 423# 424 557 2772
,RPAR 76 403# 404 480 518 958 965 1726 2823 2880 2894 3206 3239 3497
3753 3768
,RUN 451# 452 611
,SAVE 452# 453 613
,SCALA 303# 695 716 730 834 874 1072 1445 1549 2420 2626 2614 2844 3435
3525 3612 4014 4138 4160 4716 4779 5001 5050 5109 5150
,SCR 454# 455 617
,SEMI 402# 403 486 1615 1695
,SGN 433# 434 577
,SIN 425# 426 561
,SLASH 397# 398 474 2926 2936
,SQR 427# 428 565
,SQUOT 419# 420 510 1094 1621 4910 4914 4916 4917 4933
,STAR 396# 397 472
,STEP 405# 406 535 1425
,STOP 384# 385 605
,SVAR 305# 1398 1547
,TAB 434# 448 579 1625
,TERM 401# 402 2741
,TEXT 459# 1898 1708 4918 4938 4941 4979
,THEN 406# 407 533 1252 1288 1308 5121
,TO 404# 405 529 1411
,UNARY 399# 400 2743
,UPARR 395# 396 476 2921 2924 2938 2942
$ADR 62 2235
$DVR 61 2987 3344

```
$ERVEC      64   2232   2975   2983   3179   3184   3187   3257
$IR         59   2994   3254   3378   3587   3595
$LONGE     986    989    995    998   1021   1024   1342   1345   1351   1354   1381   1384   1464   1467
          1591   1594   1753   1756   1849   1852   1929   1932   1939   1942   2356   2359   2385   2388
          2411   2560   2563   2854   2857   3013   3019   3165   3168   3271   3274   3351   3354   3449
          3492   3950   3953   4068   4071   4291   4660   4663   5080   5083   5090   5093
$LPBSZ     103   5397
$MLH        60   2979   3334   3337   3384
$NOLPT     250    253   2171   2464   2577   2580   4645   4649   5386
$NOPOW     215    219   2191
$NOPTP     241    246   2121   2150   2458   2571   2574   2585   2588   3963   4638   4641   5356
$NOSTR       2#   436    447    581    795   1082   1092   1168   1177   1213   1279   1371   1376   1405
          1415   1429   1620   1631   1652   1706   1795   1820   1861   1905   1962   2206   2315   2329
          2365   2609   2617   2659   2763   2794   2819   2827   2839   2849   2864   2873   2887   2947
          3000   3023   3052   3149   3190   3197   3229   3235   3403   3419   3430   3446   3520   3537
          3558   3743   3759   3773   4022   4058   4182   4185   4192   4407   4546   4745   4782   4786
          5007   5017   5029   5039   5052   5159   5163   5195
$POLSH      58   3866
$PPBSZ      95   5380
$PRBSZ      99   5367
$PRORG      91    261
$SBR        62   3869
$STKSZ      82     87
```

```
BASICL  MACX11   V021   22-MAR-73   15:41   PAGE 2

      2                             ;  BASIC/RTS  PART1=BASICL
      3                             ;
      4                             ;  DEC-11-LPTBA-A-LA1
      5                             ;
      6                             ;  COPYRIGHT 1973
      7                             ;
      8                             ;  DIGITAL EQUIPMENT CORPORATION
      9                             ;  MAYNARD,MASSACHUSETTS 01754
     10
```

```
                        .TITLE  BASICL  V001A EDIT #61 (REF) 03/01/73
                                        SOURCE FILE #1
000000                  .ASECT
;
;
;
; BASIC CONSISTS OF THREE MODULES:
;       1) BASICL - INTERPRETER WITH SYSTEM I/O
;       2) FPMP-11 - MATH PACKAGE CONDITIONALIZED FOR USE IN BASIC
;       3) BASICM - USER AREA AND ONCE-ONLY CODE
;
;
;
;
;
;
;
; ORIGINAL PAPER TAPE VERSION   BY: LEN ELEKMAN
;
; MODIFICATION AND COMMENTS     BY: ROY FOLK
;
; COMPLETION AND FURTHER
; COMMENTS                      BY: ANN STANKARD
;
```



```
;*****************************************************
;*****************************************************
;*************                                 ***********
;*************  GLOBALS: ASSY, PARAMS,;        ***********
;*************  DESCRIPTION; LOW CORE;         ***********
;*************  GENERAL TABLES,                ***********
;*************  CONSTANTS, STORAGE             ***********
;*************                                 ***********
;*****************************************************
;*****************************************************
;
;
;
;
; GLOBALS
;
; --FPMP-11
;
        .GLOBL  $POLSH
        .GLOBL  $IR
        .GLOBL  $MLR
        .GLOBL  $DVR
        .GLOBL  $ADR,$SBR
        .GLOBL  SIN,COS,SQRT,ALOG,ATAN,EXP
        .GLOBL  $ERVEC
;
; --BASIC2
;
        .GLOBL  TPB, IKS
        .GLOBL  START
        .GLOBL  USRAREA
        .GLOBL  FILLCO
        .GLOBL  LIMIT, PDL, ARRAYS, POSIZE
        .GLOBL  ERRPDL, ERRMIX, ERRSYN, ERRARG
        .GLOBL  TABLE2, TBL3EN
        .GLOBL  EVAL, GETVAR, STOVAR, MSG
        .GLOBL  COLUMN, FAC1, FAC2, .RPAR, .LPAR
        .GLOBL  INT, MAKEST, OPRATO, SCPRAT
        .GLOBL  .COMMA, T1, T2, T3, .EOL
        .GLOBL  NUMOUT, NUMSGN, ARGB, STPRO
        .GLOBL  SAVCHAR,VAL,NORM
        .GLOBL  RND1, RND2
        .GLOBL  $STKSZ, ERRFPU
```

```
                        ;
                        ; ASSEMBLY PARAMS,
                        ;
                                ,IFNDF  $STKSZ  ;SIZE OF STACK
                        $STKSZ  =200            ;BYTES
                                ,ENDC
                        ;
                                ,IFNDF  $PRORG  ;PROG, ORIGIN AFTER VECTOR SPACE
                        $PRORG  =400
                                ,ENDC
                        ;
                                ,IFNDF  $PPBSZ  ;PP BUFF, SIZE
                        $PPBSZ  =30
                                ,ENDC
                        ;
                                ,IFNDF  $PRBSZ  ;PAPER-TAPE READER BUFF, SIZE
                        $PRBSZ  =30
                                ,ENDC
                        ;
                                ,IFNDF  $LPBSZ  ;LINE-PRINTER BUFF, SIZE
                        $LPBSZ  =40
                                ,ENDC
                        ;
                        ;  $NOPTP = NO PAPER TAPE; DEFINE TO ELIMINATE CODE FOR HIGH SPEED
                        ;   PAPER TAPE
                        ;
                        ;  $NOLPT = NO LINE PRINTER; DEFINE TO ELIMINATE LINE PRINTER CODE
                        ;
                        ;  $LONGER = LONG ERROR MESSAGES; DEFINE TO GET LONG,
                        ;       EXPLANATORY ERROR MESSAGES,
                        ;
                        ;  $NOSTR = NO STRINGS; DEFINE TO ELIMINATE STRING VARIABLE CODE
                        ;
                        ;  $NOPOW = NO POWER FAIL; DEFINE TO ASSEMBLE WITHOUT
                        ;       POWER FAIL/RESTART ROUTINE,
                        ;
                        ;
                        ;
```



```
                        ;
                        ; HOT POOP!!
                        ;
                        ; **USER AREA MAP
                        ;
                        ; HIGH ADDRESSES**+----------------+
                        ;                | GOSUB POINTERS | <--LIMIT(R5) NEEDED
                        ;                | 26 FN POINTERS |
                        ;                | READ POINTER   | <--PDL(R5) NEEDED
                        ;                +----------------+
                        ;                |  PUSH          |
                        ;                |  DOWN          |    PDSIZE(R5) NEEDED =
                        ;                |  LIST          |  (PDL(R5)-ARRAYS(R5))/2+STACK(INTERRUPT)
                        ;                +----------------+
                        ;                |      !   !     | <--ARRAYS(R5) NEEDED
                        ;                |  ARRAYS  !   !
                        ;                |          !   !
                        ;                |         \!/  !
                        ;                |          V   !
                        ;                +----------------+
                        ;                |   STRINGS      |
                        ;                +----------------+
                        ;                |          A   !
                        ;                |         /!\  !
                        ;                |          !   !
                        ;                | SYMBOLS  !   !
                        ;                +----------------+
                        ;                |          A   !
                        ;                |         /!\  !
                        ;                | INTERP,  !   !
                        ;                | CODE     !   ! <--CODE(R5) NEEDED
                        ;                +----------------+
                        ;                |   USER         |
                        ;                |   LINE         |
                        ;                |   BUFFER       | <--LINE(R5) NEEDED
                        ;                +----------------+
                        ;                | USER I/O BUFF, |
                        ;                | AND BUFF, WDR, |
                        ;                | SPACE (TTY)    |
                        ;                +----------------+
                        ;                |  USER AREA     |
                        ;                | STORAGE CELLS  |
                        ; R5 POINTS-->   |                |
                        ;                +----------------+
                        ;
```

```
                                ;
                                ;**
                                ;
                                ; CODE AREA CONTAINS STRING OF CODE BYTES WHICH COMPRISE
                                ;  THE COMPILED CODE TO BE INTERPETED.  THE SYNTAX SCAN OF THESE
                                ;  CODE BYTES IS FACILITATED BY THE JUDICIOUS PLACEMENT
                                ;  OF CERTAIN OF THESE CODE BYTES TO BE CALLED 'TOKENS',
                                ;  IF THE HIGH BIT OF A TOKEN IS ON
                                ;  IT IS A SYSTEM SYMBOL (S.SYM), (SEE TABLE, BELOW.)
                                ;  HIGH BIT OFF SIGNALS TOKEN AS THE HIGH ORDER BYTE OF A WORD
                                ;  (LOW ORDER BYTE FOLLOWS TOKEN) USED AS AN ADDRESS OFFSET INTO
                                ;  THE USER SYMBOL TABLE (USPTR).
                                ;
                                ;--SYMBOL TABLE ENTRIES
                                ;
                                ; ARE MADE FOR LINE NUMBERS, SCALARS, NUMERIC ARRAYS, AND
                                ;  STRINGS, AS SHOWN (IN ORDER):
                                ;
                                ;       LINENO  177779  177776  177777
                                ;       ADDRESS VALUE   ADDRESS ADDRESS
                                ;               VALUE   MAXSS1  MAXSS1
                                ;               0       MAXSS2  MAXSS2
                                ;               VARNAME VARNAME STRINGNAME
                                ;
                                ;--GENERAL REGISTER USAGE
                                ;
                                ; R1 IS BASIC EXECUTION PC
                                ; R4 IS THE EXECUTION STACK DEPTH
                                ; R5 IS THE POINTER TO THE USER AREA
```



```
                                ;
                                ; INTERUPT VECTORS AND LOWEST CORE
                                ;
000000                          .       =0
000000  000167  001076                  JMP     START           ;RESTART AT LOC, #0
000004                          .       =4
000004  000006  000000                  .       .+2,0           ;TIME OUT, BUSS ERROR
000010                          .       =10
000010  000012  000000                  .       .+2,0           ;RESERVED INSTRUCTION
000014                          .       =14
000014  000016  000000                  .       .+2,0           ;DEBUG, TRAP VEC,
000020                          .       =20
000020  010320  000000                  .       BOMB,0          ;IOT TRAP VEC,
                                ;
000024                          .       =24
                                ;
                                ;       .IFNDF  $NOPOW
000024  007562  000000                  .       POWDWN,0        ;POWER FAIL/RESTART
                                ;       .ENDC
                                ;
                                ;       .IFDF   $NOPOW
                                ;       .       .+2,0   ;HALT ON POWER FAIL
                                ;       .ENDC
                                ;
000030                          .       =30
000030  000032  000000                  .       .+2,0           ;EMT TRAP
000034                          .       =34
000034  000036  000000                  .       .+2,0           ;'TRAP' TRAP
                                ;
                                ;  --'SYSTEM' AREA
                                ;
000040                          .       =40
000040     001     101          VERNUM: .BYTE   001,'A          ;VERSION NUMBER
000042  000000  000000  000000          .       0,0,0,0,0,0,0,0
000050  000000  000000  000000
000056  000000
                                ;
                                ; --INTERUPT VECTORS
                                ;
000060                          .       =60
000060  000722  000200                  .       KBINT,PR4       ;KEYBOARD
000064                          .       =64
000064  007074  000200                  .       TPINT,PR4       ;TELEPRINTER
000070                          .       =70
                                ;       .IFNDF  $NOPTP
000070  007336  000200                  .       PTRINT,PR4      ;HSP, PT, READER
000074                          .       =74
000074  007436  000200                  .       PPINT,PR4       ;HSP, PT, PUNCH
                                ;       .ENDC
                                ;       .IFDF   $NOPTP
                                ;       .       0,0,0,0
                                ;       .ENDC
000200                          .       =200
                                ;       .IFNDF  $NOLPT
000200  007510  000200                  .       LPINT,PR4
```

```
                                        ;ENDC
                                        ;IFDF   $NOLPT
                                        .       0,0
                                        ;ENDC
                000240                  ,       .=240
000240  000240  000242  000000          .       ,+2,0           ;PIRQ
                000244                  ,       .=244
000244  000244  000000G 000000          .       ERRFPU,0        ;FLOATING POINT TRAP

                000400                  ,       .SPRORG                 ;START OF CODE (MAY HAVE TO CHANGE,
                                                                        ;  DEPENDING UPON ATTACHED DEVS,)
```



```
                                        ;
                                        ; GENERAL ASSIGNMENTS, VARIABLES, GLOBALS, ETC,
                                        ;

                                        ; --REGISTER ASSIGNMENTS
                                        ;
                000000                  R0      =%0
                000001                  R1      =%1
                000002                  R2      =%2
                000003                  R3      =%3
                000004                  R4      =%4
                000005                  R5      =%5
                000006                  SP      =%6
                000007                  PC      =%7
                                        ;
                                        ; --DEVICE REGISTER CONSTANTS
                                        ;
                177560                  TKS     =177560
                177562                  TKB     =177562
                177564                  TPS     =177564
                177566                  TPB     =177566
                177550                  PRS     =177550
                177552                  PRB     =177552
                177554                  PPS     =177554
                177556                  PPB     =177556
                177514                  LPS     =177514
                177516                  LPB     =177516
                                        ;
                                        ; --GENERAL CONSTANTS
                                        ;
                000011                  TAB     =11
                000012                  LF=     012
                000014                  FF      =14
                000015                  CR=     015
                000040                  BL=     040
                177776                  PS      =177776
                000140                  PR3     =140            ;PRIORITY LEVEL 3
                000200                  PR4     =200
                000340                  PR7     =340
                177775                  .SCALAR =177775         ;USER SYM, TABLE FLAG FOR SCALAR
                177776                  .NVAR   =177776         ;FLAG FOR NUMERIC ARRAY VARIABLE
                177777                  .SVAR   =177777         ;FLAG FOR STRING VAR,
```

```
                                ;
                                ; --USER AREA STORAGE CELL OFFSETS
                                ;
000000          SYMBOLS =       0               ;CONTAINS ADDR OF THE FIRST SYMBOL
000002          LIMIT   =       SYMBOLS+2       ;CONTAINS ADDR OF HIGHEST WD OF USER AREA
000004          PDL     =       LIMIT+2         ;CONTAINS ADDR OF EMPTY STACK
000006          PDSIZE  =       PDL+2           ;CONTAINS LOW LIMIT OF STACK
000010          ARRAYS  =       PDSIZE+2        ;CONTAINS ADDR OF HIGHEST WORD OF ARRAYS
000012          HIFREE  =       ARRAYS+2        ;CONTAINS ADDR OF HIGHEST FREE WORD
000014          LOFREE  =       HIFREE+2        ;CONTAINS ADDR OF LOWEST FREE WORD
000016          CODE    =       LOFREE+2        ;CONTAINS ADDR OF INTERPRETIVE CODE
000020          LINE    =       CODE+2          ;CONTAINS ADDR OF USER LINE BUFFER
000022          VARSAV  =       LINE+2          ;VAR SAVE FOR ASSIGNMENT
000024          SS1SAVE =       VARSAV+2        ;SS1 SAVE FOR ASSIGNMENT
000026          SS2SAVE =       SS1SAVE+2       ;SS2 SAVE FOR ASSIGNMENT
000030          LINENO  =       SS2SAVE+2       ;CONTAINS THE LINE NUMBER
000032          GSBCTR  =       LINENO+2        ;CONTAINS 33*DEPTH OF ACTIVE GOSUBS
000034          COLUMN  =       GSBCTR+2        ;HAS ADDR OF COL CT FOR CURRENT DEV
000036          CLMNTTY =       COLUMN+2        ;LAST TTY COLUMN TYPED
000040          FAC1    =       CLMNTTY+2       ;HIGH ORDER FLOATING VALUE
000042          FAC2    =       FAC1+2          ;LOW ORDER FLOATING VALUE
000044          R0SAVE  =       FAC2+2          ;PLACE FOR R0 WHILE IN FPMP11
000046          R1SAVE  =       R0SAVE+2        ;DITTO R1
000050          R2SAVE  =       R1SAVE+2        ;DITTO R2
000052          R3SAVE  =       R2SAVE+2        ;DITTO R3
000054          R4SAVE  =       R3SAVE+2        ;DITTO R4
000056          T1      =       R4SAVE+2        ;SHORT TERM TEMPORARY
000060          T2      =       T1+2            ;DITTO
000062          T3      =       T2+2            ;DITTO
000064          RND1    =       T3+2            ;HISTORY OF RND
000066          RND2    =       RND1+2          ;DITTO
000070          RNDCT   =       RND2+2          ;RANDOMIZER
000072          LOSTR   =       RNDCT+2         ;LOW LIMIT OF STRING STORAGE
000074          HISTR   =       LOSTR+2         ;HIGH LIMIT OF STRING STORAGE
                                ; --THESE NEXT TWO MUST BE LO BYTE AND HI BYTE, RESPECTIVELY,
                                ;   OF SAME WORD
000076          ODEV    =       HISTR+2         ;OUTPUT DEV CODE (TTY=0,PT=2,LP=4)
000077          IDEV    =       ODEV+1          ;INPUT DEV CODE (TTY=0,PR=2)
000100          TPHD    =       ODEV+2          ;HOLDS START OF TELEPRT BUFF HDR
000102          KBHD    =       TPHD+2          ;HOLDS START OF KBD BUFF HDR
000104          ECHOSP  =       KBHD+2          ;ADDR OF NEXT ECHO CHAR (IF NON=0)
000106          CNCFLG  =       ECHOSP+2        ;'+C' FLAG, NON=0 IF PENDING
000107          CNOFLG  =       CNCFLG+1        ;'+O' FLAG, DITTO
000110          FILLCO  =       CNOFLG+1        ;FILL-COUNT
000111          FILLNO  =       FILLCO+1        ;NO OF FILL CHARS
000112          FILLCH  =       FILLNO+1        ;CHAR BEFORE FILL
000113          SPARE   =       FILLCH+1        ; (SPARE BYTE)
                                ;
                                ; --I/O BUFFER HEADER OFFSETS
                                ;
000000          BSTRT   =0      ;(R1)   START OF BUFF,
000002          BEND    =2      ;BEND(R1)       END OF BUFFER
000004          BGET1   =4      ;BGET1(R1)      FIRST GET POINTER
000006          BGET2   =6      ;BGET2(R1)      SECOND GET PTR,
000010          BPUT    =10     ;BPUT(R1)       PUT PTR,
```



```
000012          BFSPEC  =12     ;BFSPEC(R1)     SPECIAL WORD - USE PARTIC, TO DEV.
                                ;
                                ; --SYSTEM VARIABLES
                                ;
000400  000000  CLMNPP: .WORD   0       ;PAPER TAPE PUNCH COLUMN POSITION
000402  000000  CLMNLP: .WORD   0       ;LINE PRINTER COLUMN POSITION
```

```
                                ;
                                ; ** SYSTEM TOKEN DEFINITIONS
                                ;
                                ;
000201                          ,EOL=   201     ;BEGINNING OF SEQUENCE USED BY 'KEYWDS' AND 'TABLE1'
000202                          ,END=   ,EOL+1
000203                          ,FOR=   ,END+1
000204                          ,GOSUB= ,FOR+1
000205                          ,GOTO=  ,GOSUB+1
000206                          ,IF=    ,GOTO+1
000207                          ,INPUT= ,IF+1
000210                          ,LET=   ,INPUT+1
000211                          ,NEXT=  ,LET+1
000212                          ,PRINT= ,NEXT+1
000213                          ,RETURN=,PRINT+1
000214                          ,STOP=  ,RETURN+1
000215                          ,DIM=   ,STOP+1
000216                          ,RANDOM=,DIM+1
000217                          ,RESTOR=,RANDOM+1
000220                          ,REM=   ,RESTOR+1
000221                          ,DEF=   ,REM+1
000222                          ,READ=  ,DEF+1
000223                          ,DATA=  ,READ+1
000224                          ,CALL=  ,DATA+1
000225                          ,EOF=   ,CALL+1 ;END OF SEQUENCE USED BY 'TABLE1'
000226                          ,AMPERS=,EOF+1
000227                          ,UPARRO=,AMPERS+1;BEGINNING OF SEQUENCE USED BY 'TABLE2' AND OPR PREC,
000230                          ,STAR=  ,UPARRO+1
000231                          ,SLASH= ,STAR+1
000232                          ,PLUS=  ,SLASH+1
000233                          ,UNARY= ,PLUS+1
000234                          ,MINUS= ,UNARY+1
000235                          ,TERM=  ,MINUS+1;END OF SEQUENCE USED BY 'TABLE2'
000236                          ,SEMI=  ,TERM+1
000237                          ,RPAR=  ,SEMI+1
000240                          ,TO=    ,RPAR+1
000241                          ,STEP=  ,TO+1
000242                          ,THEN=  ,STEP+1
000243                          ,COMMA= ,THEN+1
000244                          ,LE=    ,COMMA+1
000245                          ,EL=    ,LE+1
000246                          ,GE=    ,EL+1
000247                          ,EG=    ,GE+1
000250                          ,NE=    ,EG+1
000251                          ,EN=    ,NE+1
000252                          ,LT=    ,EN+1
000253                          ,GT=    ,LT+1
000254                          ,EQ=    ,GT+1   ;END OF SEQUENCE USED BY OPERATOR PRECEDENCE
000255                          ,LPAR=  ,EQ+1
000256                          ,DQUOT= ,LPAR+1
000257                          ,SQUOT= ,DQUOT+1
000260                          ,COLON  =,SQUOT+1
000261                          ,POUND= ,COLON+1
000262                          ,FN=    ,POUND+1
000263                          ,RNDL=  ,FN+1   ;BEGINNING OF SEQUENCE USED BY 'TABLE5'
```



```
000264                          ,RND=   ,RNDL+1
000265                          ,SIN=   ,RND+1
000266                          ,COS=   ,SIN+1
000267                          ,SQR=   ,COS+1
000270                          ,ATN=   ,SQR+1
000271                          ,EXP=   ,ATN+1
000272                          ,LOG=   ,EXP+1
000273                          ,ABS=   ,LOG+1
000274                          ,INT=   ,ABS+1
000275                          ,SGN=   ,INT+1
000276                          ,TAB=   ,SGN+1
                                ;
                                        ,IFNDF  $NOSTR
000277                          ,LEN=   ,TAB+1
000300                          ,ASC=   ,LEN+1
000301                          ,CHR$=  ,ASC+1
000302                          ,POS=   ,CHR$+1
000303                          ,SEG=   ,POS+1
000304                          ,VAL=   ,SEG+1
000305                          ,STR=   ,VAL+1  ;END OF SEQUENCE USED BY 'TABLE5'
000306                          ,LIST=  ,STR+1  ;BEGINNING OF SEQUENCE USED BY 'TABLE4'
                                        ,ENDC
                                ;
                                        ,IFDF   $NOSTR
                                ,LIST=  ,TAB+1
                                        ,ENDC
                                ;
000307                          ,RUN=   ,LIST+1
000310                          ,SAVE=  ,RUN+1
000311                          ,OLD=   ,SAVE+1
000312                          ,SCR=   ,OLD+1
000313                          ,CLEAR= ,SCR+1  ;END OF SEQUENCE USED BY 'TABLE4' AND 'KEYWDS'
000374                          ,FLIT=  374
000375                          ,ILIT1= 375
000376                          ,ILIT2= 376
000377                          ,TEXT   =377
```

```
                                        ;
                                        ; **KEYWORD TABLE
                                        ;
                                        ;       ENTRIES ARE ORDERED BY THEIR FREQUENCY OF
                                        ;       OCCURRENCE.  ALPHA KEYWORDS START AT 'KEYA',
                                        ;
000404     053                  KEYWDS: .ASCII  /+/
000405     232                          .BYTE   ,PLUS
000406     055                          .ASCII  /-/
000407     234                          .BYTE   ,MINUS
000410     052                          .ASCII  /*/
000411     230                          .BYTE   ,STAR
000412     057                          .ASCII  /\/
000413     231                          .BYTE   ,SLASH
000414     136                          .ASCII  /^/
000415     227                          .BYTE   ,UPARRO
000416     050                          .ASCII  /(/
000417     255                          .BYTE   ,LPAR
000420     051                          .ASCII  /)/
000421     237                          .BYTE   ,RPAR
000422     134                          .ASCII  /\/
000423     201                          .BYTE   ,EOL
000424     046                          .ASCII  /&/
000425     226                          .BYTE   ,AMPERS
000426     073                          .ASCII  /;/
000427     236                          .BYTE   ,SEMI
000430     054                          .ASCII  /,/
000431     243                          .BYTE   ,COMMA
000432  036474                          .ASCII  /<=/
000434     244                          .BYTE   ,LE
000435     075     074                  .ASCII  /=</
000437     244                          .BYTE   ,LE
000440  036476                          .ASCII  />=/
000442     246                          .BYTE   ,GE
000443     075     076                  .ASCII  /=>/
000445     246                          .BYTE   ,GE
000446  037074                          .ASCII  /><
000450     250                          .BYTE   ,NE
000451     076     074                  .ASCII  /></
000453     250                          .BYTE   ,NE
000454     074                          .ASCII  /</
000455     252                          .BYTE   ,LT
000456     076                          .ASCII  />/
000457     253                          .BYTE   ,GT
000460     075                          .ASCII  /=/
000461     254                          .BYTE   ,EQ
000462     042                          .ASCII  /"/
000463     256                          .BYTE   ,DQUOT
000464     047                          .ASCII  "'"
000465     257                          .BYTE   ,SQUOT
000466     072                          .ASCII  /:/
000467     260                          .BYTE   ,COLON
000470     043                          .ASCII  /#/
000471     261                          .BYTE   ,POUND
000472     133                          .ASCII  /[/
```



```
000473     255                          .BYTE   ,LPAR
000474     135                          .ASCII  /]/
000475     237                          .BYTE   ,RPAR
000476  042514  020124          KEYA:   .ASCII  /LET /          ;START OF ALPHA KEYWORDS
                                        ;
000502     210                          .BYTE   ,LET
000503     111  020106                     .ASCII  /IF /
000506     206                          .BYTE   ,IF
000507     107  020117  047524             .ASCII  /GO TO /
000514     040
000515     205                          .BYTE   ,GOTO
000516  047506  020122                     .ASCII  /FOR /
000522     203                          .BYTE   ,FOR
000523     040  047524     040             .ASCII  / TO /
000527     240                          .BYTE   ,TO
000530  042516  052130     040             .ASCII  /NEXT /
000535     211                          .BYTE   ,NEXT
000536  052040  042510  020116             .ASCII  / THEN /
000544     242                          .BYTE   ,THEN
000545     040  052123  050105             .ASCII  / STEP /
000552     040
000553     241                          .BYTE   ,STEP
000554  047507  052523  020102             .ASCII  /GOSUB /
000562     204                          .BYTE   ,GOSUB
000563     122  052105  051125             .ASCII  /RETURN/
000570     116
000571     213                          .BYTE   ,RETURN
000572  047111  052520  020124             .ASCII  /INPUT /
000600     207                          .BYTE   ,INPUT
000601     120  044522  052116             .ASCII  /PRINT /
000606     040
000607     212                          .BYTE   ,PRINT
000610  042522     115                  .ASCII  /REM/
000613     220                          .BYTE   ,REM
000614  042504  020100                  .ASCII  /DEF /
000620     221                          .BYTE   ,DEF
000621     122  040505  020104          .ASCII  /READ /
000626     222                          .BYTE   ,READ
000627     104  052101  020101          .ASCII  /DATA /
000634     223                          .BYTE   ,DATA
000635     103  046101  020114          .ASCII  /CALL /
000642     224                          .BYTE   ,CALL
000643     106     116                  .ASCII  /FN/
000645     262                          .BYTE   ,FN
000646  047122  024104                  .ASCII  /RND(/
000652     263                          .BYTE   ,RNDL
000653     122  042116                  .ASCII  /RND/
000656     264                          .BYTE   ,RND
000657     123  047111     050          .ASCII  /SIN(/
000663     265                          .BYTE   ,SIN
000664  047523  024123                  .ASCII  /COS(/
000670     266                          .BYTE   ,COS
000671     123  051121     050          .ASCII  /SQR(/
000675     267                          .BYTE   ,SQR
000676  052101  024116                  .ASCII  /ATN(/
```

```
564  000702     270                          ;BYTE   ;ATN
565  000703     105  050130      050          ;ASCII  'EXP('
566  000707     271                          ;BYTE   ;EXP
567  000710  047514  024107                   ;ASCII  'LOG('
568  000714     272                          ;BYTE   ;LOG
569  000715     101  051502      050          ;ASCII  'ABS('
570  000721     273                          ;BYTE   ;ABS
571  000722  047111  024124                   ;ASCII  'INT('
572  000726     274                          ;BYTE   ;INT
573  000727     123  047107      050          ;ASCII  'SGN('
574  000733     275                          ;BYTE   ;SGN
575  000734  040524  024102                   ;ASCII  'TAB('
576  000740     276                          ;BYTE   ;TAB
577
578                                          ;.IFNDF $NOSTR
579  000741     114  047105      050          ;ASCII  'LEN('
580  000745     277                          ;BYTE   ;LEN
581  000746  051501  024103                   ;ASCII  'ASC('
582  000752     300                          ;BYTE   ;ASC
583  000753     103  051110  024044           ;ASCII  'CHR$('
584  000760     301                          ;BYTE   ;CHR$
585  000761     120  051517      050          ;ASCII  'POS('
586  000765     302                          ;BYTE   ;POS
587  000766  042523  022107      050          ;ASCII  'SEG$('
588  000773     303                          ;BYTE   ;SEG
589  000774  040526  024114                   ;ASCII  'VAL('
590  001000     304                          ;BYTE   ;VAL
591  001001     123  051124  024044           ;ASCII  'STR$('
592  001006     305                          ;BYTE   ;STR
593                                          ;.ENDC
594
595  001007     104  046511      040          ;ASCII  'DIM '
596  001013     215                          ;BYTE   ;DIM
597  001014  040522  042116  046517           ;ASCII  'RANDOMIZE'
     001022  055111     105
598  001025     216                          ;BYTE   ;RANDOM
599  001026  042522  052123  051117           ;ASCII  'RESTORE'
     001034     105
600  001035     217                          ;BYTE   ;RESTORE
601  001036  052123  050117                   ;ASCII  'STOP'
602  001042     214                          ;BYTE   ;STOP
603  001043     105  042116                   ;ASCII  'END'
604  001046     202                          ;BYTE   ;END
605  001047     114  051511      124          ;ASCII  'LIST'
606  001053     306                          ;BYTE   ;LIST
607  001054  052522      116                  ;ASCII  'RUN'
608  001057     307                          ;BYTE   ;RUN
609  001060  040523  042526                   ;ASCII  'SAVE'
610  001064     310                          ;BYTE   ;SAVE
611  001065     117  042114                   ;ASCII  'OLD'
612  001070     311                          ;BYTE   ;OLD
613  001071     123  051103                   ;ASCII  'SCR'
614  001074     312                          ;BYTE   ;SCR
615  001075     103  042514                   ;ASCII  'CLE'
616  001100     313                          ;BYTE   ;CLEAR
```



```
617
618  001101     000                          ;BYTE   0               ;END OF TABLE FLAG
619                                          ;EVEN
620                                          ;EOT
621
```

```
                                        ;                                SOURCE FILE #2
                                        ;*********************************************
                                        ;*********************************************
                                        ;*************                     *************
                                        ;*************   MAIN FLOW ROUTINES*************
                                        ;*************                     *************
                                        ;*********************************************
                                        ;*********************************************


                                        ;
                                        ; START - PROGRAM STARTING POINT
                                        ;
001102  016705  000000G         START:  MOV     USRAREA,R5
001106  016506  000004                  MOV     POL(R5),SP
001112  005065  000104                  CLR     ECHOSP(R5)
001116  004767  007366                  JSR     PC,BUFCLR       ;CLEAR OUT ALL I/O RING BUFFERS
001122  016506  000004          SCRATCH:MOV     POL(R5),SP
001126  004767  014422                  JSR     PC,INITSCR
001132  004767  007644          CLEAR:  JSR     PC,CLRVARS
001136  000402                          BR      READY
```



```
                                        ;*********************************************
                                        ;
                                        ; READY - PRINT 'READY'
                                        ;
001140  004767  007344          READY0: JSR     PC,BUFCLR       ;CLEAR ALL I/O RING BUFFERS
001144  016506  000004          READY:  MOV     POL(R5),SP
001150  005065  000106                  CLR     CNCFLG(R5)      ;'^C' AND '^O' FLAGS
001154  005065  000076                  CLR     ODEV(R5)
001160  012765  000036  000034          MOV     #CLMNTTY,COLUMN(R5)     ;SET TO COUNT TTY COLUMNS
001166  060565  000034                  ADD     R5,COLUMN(R5)   ; NOW
001172  004167  016254                  JSR     R1,MSG
001176     015     012                  ;BYTE   CR,LF
001200  042522  042101     131         ;ASCII  /READY/
001205     000                          ;BYTE 0
                                        ;EVEN
001206  016506  000004          READY2: MOV     POL(R5),SP
001212  004167  016234                  JSR     R1,MSG
001216     015     012     012          ;BYTE   CR,LF,LF
001221     000                          ;BYTE 0
                                        ;EVEN
001222  005065  000076          IOINIT: CLR     ODEV(R5)        ;CLR ODEV AND IDEV BYTES IN USER AREA
```

```
                                ;+-----------------------------------------------
                                ;
                                ; EDIT -
                                ;
                                ;  GET LINE, TRANSLATE INTO TOKENS, AND MOVE LINE INTO
                                ;   USER CODE SPACE, WITH ALL ENTRIES MADE INTO USER
                                ;   SYMBOL TABLE, ARRAY SPACE, AND STRING SPACE.
                                ;
001226  004767  014702        EDITI   JSR     PC,LINGET
001232  103006                        BCC     EDITL           ;NORMAL INPUT LINE
001234  127527  000016  000225        CMPB    @CODE(R5),#,EOF ;CHECK EMPTY PROGRAM
001242  001336                        BNE     READY0          ;NO, RETURN TO TTY INPUT
001244  000167  017604                JMP     DEVERR          ;YES, DEVICE NOT READY
001250  004767  020236        EDITLI  JSR     PC,TRAN
001254  005201                        INC     R1
001256  010146                        MOV     R1,-(SP)
001260  016501  000020                MOV     LINE(R5),R1
001264  160116                        SUB     R1,(SP)
001266  112100                        MOVB    (R1)+,R0
001270  100417                        BMI     EDIMMED
001272  000300                        SWAB    R0
001274  152100                        BISB    (R1)+,R0
001276  061500                        ADD     (R5),R0
001300  021027  177775                CMP     (R0),#,SCALAR
001304  103011                        BHIS    EDIMMED
001306  016501  000016                MOV     CODE(R5),R1
001312  021627  000003                CMP     (SP),#3         ;IF THERE ARE ONLY 3 BYTES THEN THE LINE
001316  001013                        BNE     EDISRCH         ;CONATINS LINENO,CR AND MEANS DELETE,
001320  005016                        CLR     (SP)
001322  005060  000002                CLR     2(R0)
001326  000427                        BR      EDISRCH
001330  105765  000077        EDIMMED:TSTB    IDEV(R5)
001334  001334                        BNE     EDIT            ;IGNORE IMM STMTS FROM NON-TTY
001336  000167  000500                JMP     IMMED
001342  004767  017622        EDISKIP:JSR     PC,SKIPEOL
001346  010104        EDISRCH:MOV     R1,R4           ;R0 POINTS TO LINENO OF THE NEW LINE,
001350  121127  000225                CMPB    (R1),#,EOF      ;@(SP) CONTAINS LENGTH OF THE NEW LINE,
001354  001452                        BEQ     EDIPUT
001356  111103                        MOVB    (R1),R3
001360  100770                        BMI     EDISKIP
001362  005201                        INC     R1
001364  000303                        SWAB    R3
001366  152103                        BISB    (R1)+,R3
001370  061503                        ADD     (R5),R3
001372  021327  177775                CMP     (R3),#,SCALAR
001376  103361                        BHIS    EDISKIP
001400  021013                        CMP     (R0),(R3)
001402  101357                        BHI     EDISKIP
001404  001036                        BNE     EDIPUT
001406  004767  017556        EDIPASS:JSR     PC,SKIPEOL
001412  121127  000225                CMPB    (R1),#,EOF
001416  001427                        BEQ     EDIOVER
001420  111103                        MOVB    (R1),R3
001422  100771                        BMI     EDIPASS
001424  005201                        INC     R1
```



```
001426  000303                        SWAB    R3
001430  152103                        BISB    (R1)+,R3
001432  061503                        ADD     (R5),R3
001434  021327  177775                CMP     (R3),#,SCALAR
001440  103362                        BHIS    EDIPASS
001442  162701  000002                SUB     #2,R1
001446  016500  000004                MOV     POL(R5),R0      ;IF A LINE IS CHANGED WHICH IS
001452  016502  000032                MOV     GSBCTM(R5),R2   ;REFFRENCED BY THE READ POINTER,AN FN
001456  021004        EDICHG: CMP     (R0),R4         ;POINTER OR A GOSUB POINTER THEN THAT
001460  101403                        BLOS    .+10            ;POINTER MUST BE CLEARED
001462  021001                        CMP     (R0),R1
001464  101001                        BHI     .+4
001466  005010                        CLR     (R0)
001470  005720                        TST     (R0)+
001472  005302                        DEC     R2
001474  003370                        BGT     EDICHG
001476  160401        EDIOVER:SUB     R4,R1
001500  000401                        BR      .+4
001502  005001        EDIPUT: CLR     R1
001504  161601                        SUB     (SP),R1         ;R1 NOW = #CHARS TO CONTRACT,
001506  016500  000004                MOV     POL(R5),R0      ;ALL REFERENCES BY THE READ POINTER
001512  016502  000032                MOV     GSBCTM(R5),R2   ;WHICH REFER TO LINES WHICH ARE MOVED
001516  021004        EDIMODF:CMP     (R0),R4         ;BECAUSE OF EDITING MUST BE RELOCATED
001520  103401                        BLO     .+4
001522  160110                        SUB     R1,(R0)
001524  005720                        TST     (R0)+
001526  005302                        DEC     R2
001530  003372                        BGT     EDIMODF
001532  005701                        TST     R1
001534  100433                        BMI     EDIGROW         ;R4 NOW = ADDRESS AT WHICH TO INSERT,
001536  001505                        BEQ     EDISAME
001540  010402        EDICONT:MOV     R4,R2
001542  061602                        ADD     (SP),R2
001544  010203                        MOV     R2,R3
001546  060103                        ADD     R1,R3
001550  112322        EDIMOVE:MOVB    (R3)+,(R2)+     ;MOVE DOWN THE CODE,
001552  020315                        CMP     R3,(R5)
001554  103775                        BLO     EDIMOVE
001556  105742                        TSTB    -(R2)
001560  001401                        BEQ     .+4
001562  005202                        INC     R2              ;R2 NOW POINTS TO BYTE AFTER THE ,EOF,
001564  030227  000001                BIT     R2,#1
001570  001401                        BEQ     .+4
001572  105022                        CLRB    (R2)+           ;R2 NOW HAS THE NEW START OF THE SYMTAB,
001574  010215                        MOV     R2,(R5)
001576  012322                        MOV     (R3)+,(R2)+     ;MOVE DOWN THE SYMBOLS,
001600  020365  000014                CMP     R3,LOFREE(R5)
001604  103774                        BLO     .-6
001606  010265  000014                MOV     R2,LOFREE(R5)
001612  000401                        BR      .+4
001614  005022                        CLR     (R2)+           ;CLEAR VACATED STRING STORAGE TO ZEROES,
001616  020203                        CMP     R2,R3
001620  103775                        BLO     .-4
001622  000453                        BR      EDISAME
001624  011500        EDIGROW:MOV     (R5),R0
```

```
 779  001626  105740                        TSTB    -(R0)
 780  001630  001401                        BEQ     .+4
 781  001632  005200                        INC     R0
 782  001634  160100                        SUB     R1,R0           ;R0 NOW POINTS PAST THE NEW HIGHEST BYTE
 783  001636  010003                        MOV     R0,R3           ;OF CODE,
 784  001640  005203                        INC     R3
 785  001642  042703  000001                BIC     #1,R3           ;R3 NOW HAS THE NEW START OF SYMTAB,
 786  001646  161503                        SUB     (R5),R3
 787  001650  066503  000014                ADD     LOFREE(R5),R3   ;R3 NOW HAS THE NEW VALUE OF LOFREE,
 788  001654  020365  000012                CMP     R3,HIFREE(R5)   ;CHECK TO SEE THAT THERE IS ENOUGH
 789  001660  101402                        BLOS    .+6
 790  001662  000167  020712        ERROV1: JMP     ERROV2
 791
 792                                        .IFNDF  $NOSTK
 793  001666  010302                        MOV     R3,R2           ;CHECK TO SEE THAT THE SPACE THAT WILL
 794  001670  005722                        TST     (R2)+           ;BE USED IS NOT OCCUPIED BY STRINGS
 795  001672  020265  000072                CMP     R2,LOSTR(R5)
 796  001676  103405                        BLO     EDIROOM
 797  001700  004767  021254                JSR     PC,UPPACK       ;NO, MOVE THEM UP
 798  001704  020265  000072                CMP     R2,LOSTR(R5)    ;TRY AGAIN
 799  001710  103364                        BHIS    ERROV1
 800                                        .ENDC
 801
 802  001712  016502  000014        EDIROOM:MOV     LOFREE(R5),R2
 803  001716  010365  000014                MOV     R3,LOFREE(R5)
 804  001722  000401                        BR      .+4
 805  001724  014243                EDIMVUP:MOV     -(R2),-(R3)     ;MOVE UP THE SYMTAB,
 806  001726  020215                        CMP     R2,(R5)
 807  001730  101375                        BHI     EDIMVUP
 808  001732  010315                        MOV     R3,(R5)
 809  001734  105043                        CLRB    -(R3)           ;CLEAR THE POSSIBLY USED FILLER
 810  001736  010002                        MOV     R0,R2
 811  001740  060100                        ADD     R1,R0           ;R0 NOW POINTS PAST OLD HIGHEST BYTE
 812  001742  000401                        BR      .+4             ;OF SYMTAB,
 813  001744  114042                        MOVB    -(R0),-(R2)     ;MOVE UP THE CODE,
 814  001746  020004                        CMP     R0,R4
 815  001750  101375                        BHI     .-4
 816  001752  016500  000020        EDISAME:MOV     LINE(R5),R0     ;MOVE THE NEW LINE INTO THE CODE,
 817  001756  010401                        MOV     R4,R1
 818  001760  012602                        MOV     (SP)+,R2
 819  001762  000401                        BR      .+4
 820  001764  112024                        MOVB    (R0)+,(4)+
 821  001766  005302                        DEC     R2
 822  001770  002375                        BGE     .-4
 823  001772  121127  000225        EDIRLC8:CMPB    (R1),#,EOF
 824  001776  001417                        BEQ     EDIJMP
 825  002000  111102                        MOVB    (R1),R2
 826  002002  100412                        BMI     EDIRLOC
 827  002004  005201                        INC     R1
 828  002006  000302                        SWAB    R2
 829  002010  152102                        BISB    (R1)+,R2
 830  002012  061502                        ADD     (R5),R2
 831  002014  022227  177775                CMP     (R2)+,#,SCALAR
 832  002020  103003                        BHIS    EDIRLOC
 833  002022  010112                        MOV     R1,(R2)
```



```
 834  002024  162712  000002                SUB     #2,(R2)
 835  002030  004767  017134        EDIRLOC:JSR     PC,SKIPEOL
 836  002034  000756                        BR      EDIRLC8
 837  002036  000167  177104        EDIJMP: JMP     EDIT
 838
```

```
                                        ;*****************************************************
                                        ;
                                        ; IMMED = IMMEDIATE MODE COMMANDS
                                        ;
                                        ;  DO IMMEDIATE ONLY COMMANDS (RUN, LIST, SCRATCH, CLEAR,
                                        ;    SAVE, AND OLD) AND SET UP OTHERS (UN-NUMBERED) FOR
                                        ;    EXECUTE.
                                        ;
002042  012600                  IMMED:  MOV     (SP)+,R0                ;R0 NOW HAS # BYTES ON INPUT LINE,
002044  005065  000076                   CLR     DDEV(R5)                ;TAKE ONLY THIS IMMED. COMM. FROM NON-TTY
002050  016504  000006                   MOV     PDSIZE(R5),R4
002054  016501  000020                   MOV     LINE(R5),R1
002060  005002                           CLR     R2
002062  151102                           BISB    (R1),R2
002064  162702  000306                   SUB     #,LIST,R2
002070  006302                           ASL     R2
002072  020227  000012                   CMP     R2,#TBL4END-TABLE4
002076  101012                           BHI     IMMSTMT
002100  062702  000002                   ADD     #2,R2
002104  060702                           ADD     PC,R2
002106  061207                           ADD     (R2),PC
002110  000102                  TABLE4: ,WORD   LIST-TABLE4
002112  000206                          ,WORD   RUN-TABLE4
002114  000124                          ,WORD   SAVE-TABLE4
002116  000062                          ,WORD   OLD-TABLE4
002120  177012                          ,WORD   SCRATCH-TABLE4  ;(IN 'START' CODE, ABOVE)
002122  177022                  TBL4END:,WORD   CLEAR-TABLE4    ;(IN 'START' CODE, ABOVE)
002124  060100                  IMMSTMT:ADD     R1,R0
002126  020065  000016                   CMP     R0,CODE(R5)             ;SEE IF AN 'EOF' CAN BE FIT ON THE LINE,
002132  103402                           BLO     .+6
002134  000167  020034                   JMP     ERRTRN
002140  112710  000225                   MOVB    #,EOF,(R0)
002144  012765  177775  000030           MOV     #,SCALAR,LINENO(R5)
002152  005065  000036                   CLR     CLMNTY(R5)              ;RE-SET ALL COLMN COUNTS
002156  005067  176216                   CLR     CLMNPP
002162  005067  176214                   CLR     CLMNLP
002166  000167  000554                   JMP     EXECUTE                 ;START RUNNING,
```



```
                                        ; 'OLD' COMMAND
002172  016506  000004          OLD:    MOV     PDL(R5),SP              ;FLUSH OUT SYSTEM
002176  004767  013352                   JSR     PC,INITSCR              ;SCRATCH
002202  004767  006574                   JSR     PC,CLRVARS
002206  004767  016722                   JSR     PC,SCANPND              ;SCAN OFF '#'
002212  004767  006464                   JSR     PC,CHKISET              ;CHECK AND SET INPUT
002216  122127  000201                   CMPB    (R1)+,#,EOL             ;MUST END LINE RIGHT
002222  001402                           BEQ     OLD001
002224  000167  010314                   JMP     ERRSX5
002230  000167  176772          OLD001: JMP     EDIT                    ;THIS DOES THE REST

                                        ; 'SAVE' COMMAND
002234  004767  016674          SAVE:   JSR     PC,SCANPND              ;SCAN OFF '#'
002240  004767  006444                   JSR     PC,CHKOSET              ;CHECK AND SET-UP OUTPUT
002244  120227  000002                   CMPB    R2,#2                   ;LINE PRINTER?
002250  003404                           BLE     LISTSV                  ;NO! LIST TAKES OVER
002252  004167  015222                   JSR     R1,MSGODEV              ;FOR LPT, START W/ 2 FORM-FEEDS
002256      014     014     000          .BYTE   FF,FF,0
                002262                  .EVEN
002262  004767  014316          LISTSV: JSR     PC,LSIPROG
002266  000167  176692                   JMP     READY

                                        ; 'LIST' COMMAND
002272  005201                  LIST:   INC     R1
002274  004767  012534                   JSR     PC,FLINE
002300  103770                           BCS     LISTSV
002302  011201                           MOV     (R2),R1                 ;GET ADDR OF CODE LINE
002304  001766                           BEQ     LISTSV                  ;IF UNDEF, NORMAL LIST
002306  004767  014276                   JSR     PC,LSILOOP              ;LIST PARTIAL PROGR
002312  000167  176626                   JMP     READY
```

```
                                        ; /RUN/ COMMAND
002316 004767 000460            RUN:    JSR     PC,CLRVARS
002322 016501 000016                    MOV     CODE(R5),R1
002326 112102                   DIMLOOP:MOVB    (R1)+,R2
002330 100406                           BMI     DIMNONO
002332 000302                           SWAB    R2
002334 152102                           BISB    (R1)+,R2
002336 061502                           ADD     (R5),R2
002340 011265 000030                    MOV     (R2),LINENO(R5)
002344 112102                           MOVB    (R1)+,R2
002346 120227 000215            DIMNONO:CMPB    R2,#,DIM
002352 001415                           BEQ     DIMGOT
002354 120227 000221                    CMPB    R2,#,DEF
002360 001530                           BEQ     DEFGOT
002362 120227 000210                    CMPB    R2,#,RANDOM
002366 001504                           BEQ     RNDGOT
002370 120227 000225                    CMPB    R2,#,EOF
002374 001537                           BEQ     DIMDONE
002376 005301                           DEC     R1
002400 004767 016504            DEFDUN: JSR     PC,SKIPEOL
002404 000750                           BR      DIMLOOP
002406 112102                   DIMGOT: MOVB    (R1)+,R2
002410 100506                           BMI     ERRDIM
002412 000302                           SWAB    R2
002414 152102                           BISB    (R1)+,R2
002416 061502                           ADD     (R5),R2
002420 122127 000255                    CMPB    (R1)+,#,LPAR
002424 001100                           BNE     ERRDIM
002426 005003                           CLR     R3
002430 121127 000375                    CMPB    (R1),#,ILIT1
002434 001406                           BEQ     ALLOC1
002436 122127 000376                    CMPB    (R1)+,#,ILIT2
002442 001071                           BNE     ERRDIM
002444 111103                           MOVB    (R1),R3
002446 100467                           BMI     ERRDIM
002450 000303                           SWAB    R3
002452 005201                   ALLOC1: INC     R1
002454 152103                           BISB    (R1)+,R3
002456 012704 177777                    MOV     #-1,R4
002462 122127 000237                    CMPB    (R1)+,#,RPAR
002466 001423                           BEQ     DOALLOC
002470 124127 000243                    CMPB    -(R1),#,COMMA
002474 001054                           BNE     ERRDIM
002476 005201                           INC     R1
002500 005004                           CLR     R4
002502 121127 000375                    CMPB    (R1),#,ILIT1
002506 001406                           BEQ     ALLOC2
002510 122127 000376                    CMPB    (R1)+,#,ILIT2
002514 001044                           BNE     ERRDIM
002516 111104                           MOVB    (R1),R4
002520 100442                           BMI     ERRDIM
002522 000304                           SWAB    R4
002524 005201                   ALLOC2: INC     R1
002526 152104                           BISB    (R1)+,R4
002530 122127 000237                    CMPB    (R1)+,#,RPAR
```



```
002534 001034                           BNE     ERRDIM
002536 021227 177776            DOALLOC:CMP     (R2),#,NVAR
002542 001431                           BEQ     ERRDIM
002544 002403                           BLT     DIMSCLR
002546 005762 000004                    TST     4(R2)
002552 100025                           BPL     ERRDIM
002554 004767 005238            DIMSCLR:JSR     PC,ALLOC        ;VAR(R2),SS1(R3),SS2(4)
002560 122127 000243                    CMPB    (R1)+,#,COMMA
002564 001710                           BEQ     DIMGOT
002566 124127 000201                    CMPB    -(R1),#,EOL
002572 001015                           BNE     ERRDIM
002574 005201                           INC     R1
002576 000653                           BR      DIMLOOP
                                        ;RANDOMIZE STATEMENT
002600 016565 000070 000064     RNDGOT: MOV     RNDCT(R5),RND1(R5)
002606 152765 000001 000064             BISB    #1,RND1(R5)
002614 122127 000201                    CMPB    (R1)+,#,EOL
002620 001642                           BEQ     DIMLOOP
002622 000167 007716                    JMP     ERRSYN
002626 000004                   ERRDIM: IOT
                                        .IFNDF  $LONGER
002630 042111     115                   .ASCII  'IDM'
                                        .ENDC
                                        .IFDF   $LONGER
                                        .ASCII  'ILLEGAL DIM'
                                        .ENDC
002633     000                          .BYTE 0
                                        .EVEN
002634 000004                   ERRDEF: IOT
                                        .IFNDF  $LONGER
002636 042111     104                   .ASCII  \IDF\
                                        .ENDC
                                        .IFDF   $LONGER
                                        .ASCII  'ILLEGAL DEF'
                                        .ENDC
002641     000                          .BYTE 0
                                        .EVEN
002642 122127 000262            DEFGOT: CMPB    (R1)+,#,FN
002646 001372                           BNE     ERRDEF
002650 112102                           MOVB    (R1)+,R2
002652 066502 000004                    ADD     PDL(R5),R2
002656 005712                           TST     (R2)
002660 001365                           BNE     ERRDEF
002662 122127 000255                    CMPB    (R1)+,#,LPAR
002666 001362                           BNE     ERRDEF
002670 010112                           MOV     R1,(R2)
002672 000642                           BR      DEFDUN
002674 005065 000036            DIMDONE:CLR     CLMNTTY(R5)     ;RE-SET ALL COLUMN COUNTS
002700 005067 175474                    CLR     CLMNPP
002704 005067 175472                    CLR     CLMNLP
002710 016504 000006                    MOV     POSIZE(R5),R4
002714 016501 000016                    MOV     CODE(R5),R1
002720 121127 000225                    CMPB    (R1),#,EOF
002724 001010                           BNE     EXECUTE         ;START RUNNING
002726 004167 014912            ERRRUN: JSR     R1,MSGERR
```

```
 1018                                   ,IFNDF  $LONGER
 1019  002732  050116     122           ,ASCII  \NPR\
 1020                                   ,ENDC
 1021                                   ,IFDF   $LONGER
 1022                                   ,ASCII  'NO PROGRAM'
 1023                                   ,ENDC
 1024  002735     000                   ,BYTE 0
 1025                                   ,EVEN
 1026  002736  000167  176244           JMP     READY2
 1027
```



```
 1028                                   ;-----------------------------------------------------------
 1029                                   ;
 1030                                   ; EXECUTE - EXECUTE COMMAND LINE
 1031                                   ;
 1032  002742  004767  016222  IGNORE1: JSR     PC,SKIPEOL
 1033  002746  105765  000100  EXECUTE: TSTB    CNCFLG(R5)      ;^C' HIT?
 1034  002752  001404                   BEQ     NOCNC
 1035  002754  105065  000106           CLRB    CNCFLG(R5)
 1036  002760  000167  176160           JMP     READY
 1037  002764  112102           NOCNC:  MOVB    (R1)+,R2
 1038  002766  002035                   BGE     NOTSYM          ;ITS A POINTER,
 1039  002770  042702  177600           BIC     #^200,R2
 1040  002774  006302                   ASL     R2
 1041  002776  020227  000052           CMP     R2,#TBL1END-TABLE1+2
 1042  003002  101115                   BHI     ERRSX1          ;NOT A STATEMENT WORD,
 1043  003004  060702                   ADD     PC,R2
 1044  003006  061207                   ADD     (R2),PC         ;BRANCH THRU TABLE1,
 1045  003010  177736           TABLE1: ,WORD   EXECUTE-TABLE1
 1046  003012  000330                   ,WORD   END-TABLE1
 1047  003014  001224                   ,WORD   FOR-TABLE1
 1048  003016  001040                   ,WORD   GOSUB-TABLE1
 1049  003020  001040                   ,WORD   GOTO-TABLE1
 1050  003022  000372                   ,WORD   IF-TABLE1
 1051  003024  002640                   ,WORD   INPUT-TABLE1
 1052  003026  000246                   ,WORD   LET-TABLE1
 1053  003030  001742                   ,WORD   NEXT-TABLE1
 1054  003032  002254                   ,WORD   PRINT-TABLE1
 1055  003034  001144                   ,WORD   RETURN-TABLE1
 1056  003036  000352                   ,WORD   STOP-TABLE1
 1057  003040  177732                   ,WORD   IGNORE-TABLE1
 1058  003042  177732                   ,WORD   IGNORE-TABLE1
 1059  003044  001026                   ,WORD   RESTORE-TABLE1
 1060  003046  177732                   ,WORD   IGNORE-TABLE1
 1061  003050  177732                   ,WORD   IGNORE-TABLE1
 1062  003052  003346                   ,WORD   READ-TABLE1
 1063  003054  177732                   ,WORD   IGNORE-TABLE1
 1064  003056  000074                   ,WORD   CALL-TABLE1
 1065  003060  000330           TBL1END:,WORD   EOF-TABLE1
 1066  003062  000302           NOTSYM: SWAB    R2
 1067  003064  152102                   BISB    (R1)+,R2
 1068  003066  261502                   ADD     (R5),R2
 1069  003070  021227  177775           CMP     (R2),#,SCALAR
 1070  003074  103075                   BHIS    ASSIGN          ;NOT A LINENO,
 1071  003076  011265  000030           MOV     (R2),LINENO(R5) ;SAVE THE LINENO,
 1072  003102  000721                   BR      EXECUTE
 1073
 1074
```

```
                                ; 'CALL' STATEMENT
                                ;       CALL "PROG" (,,,)
                                CALL:
                                
                                        .IFNDF  $NOSTR
003104  004767  000272                  JSR     PC,EVAL         ;EVALUATE FUNCTION NAME
003110  103052                          BCC     ERRSX1
003112  012600                          MOV     (SP)+,R0
003114  020027  177777                  CMP     R0,#177777      ;CHECK NULL STRING
003120  001444                          BEQ     ERRFN1          ;YES, ERROR
003122  112003                          MOVB    (R0)+,R3        ;R3 IS STRING LENGTH
003124  112020                          MOVB    (R0)+,(R0)+     ;R0 IS ADDR OF CHARS
                                        .ENDC
                                
                                        .IFDF   $NOSTR
                                        MOVB    (R1)+,R2        ;R2 IS QUOTE CHAR
                                        CMPB    R2,#,SQUOT
                                        BEQ     CALL1
                                        CMPB    R2,#,DQUOT
                                        BNE     ERRSX1
                                CALL1:  CMPB    (R1)+,#,TEXT
                                        BNE     ERRSX1
                                        MOV     R1,R0           ;R0 IS ADDR OF CHARS
                                        CLR     R3
                                CALLP:  INC     R3              ;COUNT CHARS IN R3
                                        TSTB    (R1)+
                                        BNE     CALLP
                                        CMPB    (R1)+,R2        ;CHECK CLOSING QUOTE
                                        BNE     ERRSX1
                                        DEC     R3
                                        BEQ     ERRFN1
                                        .ENDC
                                
003126  013702  000046          ;       INIT TABLE SEARCH
                                        MOV     @#46,R2
003132  001437                          BEQ     ERRFN1          ;NO FUNCTIONS DEFINED
003134  010246                          MOV     R2,-(SP)        ;SAVE ON STACK
                                ;       CHECK END TABLE
003136  105712                  CALLCK: TSTB    (R2)
003140  001434                          BEQ     ERRFN1
                                ;       CHECK THAT (R3) CHARS MATCH
003142  010046                          MOV     R0,-(SP)
003144  010346                          MOV     R3,-(SP)
003146  122022                  CALLM1: CMPB    (R0)+,(R2)+
003150  001034                          BNE     CALLNM
003152  005303                          DEC     R3
003154  001374                          BNE     CALLM1
                                ;       CHECK THAT 4+(R3) CHARS ARE " IN TABLE
003156  161603                          SUB     (SP),R3
003160  062703  000004                  ADD     #4,R3
003164  002422                          BLT     ERRFN1
003166  001404                          BEQ     CALLX
003170  105722                  CALLM2: TSTB    (R2)+
003172  001023                          BNE     CALLNM
003174  005303                          DEC     R3
```



```
003176  001374                          BNE     CALLM2
                                ;       RETURN ANSWER
003200  062706  000006          CALLX1: ADD     #6,SP           ;POP STACK
003204  011202                          MOV     (R2),R2
003206  001411                          BEQ     ERRFN1
003210  010146                          MOV     R1,-(SP)
003212  010446                          MOV     R4,-(SP)
003214  010546                          MOV     R5,-(SP)
                                
003216  004712                          JSR     PC,(R2)
                                
003220  012605                          MOV     (SP)+,R5
003222  012604                          MOV     (SP)+,R4
003224  012601                          MOV     (SP)+,R1
003226  000167  177510                  JMP     IGNORE
003232  000167  011262          ERRFN1: JMP     ERRUFN
003236  000167  007302          ERRSX1: JMP     ERRSYN
                                ;       ADVANCE TO NEXT TABLE ENTRY
003242  012603                  CALLNM: MOV     (SP)+,R3
003244  012600                          MOV     (SP)+,R0
003246  062716  000006                  ADD     #6,(SP)
003252  011602                          MOV     (SP),R2
003254  000730                          BR      CALLCK
                                
                                ; 'LET' STATEMENT ROUTINE
003256  112102                  LET:    MOVB    (R1)+,R2
003260  100766                          BMI     ERRSX1          ;NOT A POINTER,
003262  000332                          SWAB    R2
003264  152102                          BISB    (R1)+,R2
003266  061502                          ADD     (R5),R2
003270  004767  012070          ASSIGN: JSR     PC,GETVAR
003274  122127  000254                  CMPB    (R1)+,#,EQ
003300  001356                          BNE     ERRSX1          ;NOT EQSIGN,
003302  004767  006074                  JSR     PC,EVAL
                                
                                        .IFNDF  $NOSTR
003306  103406                          BCS     ASSSTR
                                        .ENDC
                                
003310  122127  000201                  CMPB    (R1)+,#,EOL
003314  001350                          BNE     ERRSX1
003316  004767  015732                  JSR     PC,STOVAR
003322  000611                          BR      EXECUTE
                                
                                        .IFNDF  $NOSTR
003324  122127  000201          ASSSTR: CMPB    (R1)+,#,EOL
003330  001342                          BNE     ERRSX1
003332  004767  015776                  JSR     PC,STOSVAR
003336  000603                          BR      EXECUTE
                                        .ENDC
                                
                                ; 'EOF' OR 'END' STATEMENT
                                END:
003340  020165  000016          EOF:    CMP     R1,CODE(R5)
003344  103014                          BHIS    JMPRDY
```

```
 1185  003346  004167  014100                JSR     R1,MSG
 1186  003352     015     012                ,BYTE   CR,LF
 1187  003354     000                        ,BYTE 0
 1188          003356                        ,EVEN
 1189  003356  000167  175644                JMP     EDIT
 1190                                ; 'STOP' STATEMENT
 1191  003362  004167  014064        STOP:   JSR     R1,MSG
 1192  003366     015     012                ,BYTE   CR,LF
 1193  003370  052123  050117                ,ASCII  'STOP'
 1194  003374     000                        ,BYTE   0
 1195          003376                        ,EVEN
 1196  003376  000167  175542        JMPRDY: JMP     READY
 1197
```



```
 1198                                ; 'IF' STATEMENT ROUTINE
 1199  003402  004767  005774        IF:     JSR     PC,EVAL
 1200  003406  103114                        BCC     IFNUMER
 1201  003410  121127  000244                CMPB    (R1),#,LE
 1202  003414  103710                        BLO     ERRSX1
 1203  003416  121127  000254                CMPB    (R1),#,EQ
 1204  003422  101305                        BHI     ERRSX1
 1205  003424  020604                        CMP     SP,R4
 1206  003426  103553                        BLO     ERRPDJ
 1207  003430  112146                        MOVB    (R1)+,-(SP)
 1208  003432  004767  005744                JSR     PC,EVAL
 1209
 1210                                        ,IFNDF  $NOSTM
 1211  003436  103151                        BCC     ERRMX4
 1212                                        ,ENDC
 1213
 1214  003440  012603                        MOV     (SP)+,R3
 1215  003442  012600                        MOV     (SP)+,R0
 1216  003444  012602                        MOV     (SP)+,R2
 1217  003446  010046                        MOV     R0,-(SP)
 1218  003450  005046                        CLR     -(SP)
 1219  003452  020227  177777                CMP     R2,#-1
 1220  003456  001401                        BEQ     .+4
 1221  003460  151216                        BISB    (R2),(SP)
 1222  003462  005000                        CLR     R0
 1223  003464  020327  177777                CMP     R3,#-1
 1224  003470  001401                        BEQ     .+4
 1225  003472  151300                        BISB    (R3),R0
 1226  003474  062702  000003                ADD     #3,R2
 1227  003500  062703  000003                ADD     #3,R3
 1228  003504  000402                        BR      .+6
 1229  003506  122322        IFLOOP: CMPB    (R3)+,(R2)+
 1230  003510  001047                        BNE     IFCOMP
 1231  003512  005300                        DEC     R0
 1232  003514  002410                        BLT     IFLEND
 1233  003516  005316                        DEC     (SP)
 1234  003520  002372                        BGE     IFLOOP
 1235  003522  122327  000040                CMPB    (R3)+,#BL
 1236  003526  001040                        BNE     IFCOMP
 1237  003530  005300                        DEC     R0
 1238  003532  002373                        BGE     .-10
 1239  003534  000407                        BR      IFSEQ
 1240  003536  005716        IFLEND: TST     (SP)
 1241  003540  003405                        BLE     IFSEQ
 1242  003542  122722  000040                CMPB    #BL,(R2)+
 1243  003546  001030                        BNE     IFCOMP
 1244  003550  005316                        DEC     (SP)
 1245  003552  003373                        BGT     .-10
 1246  003554  005726        IFSEQ:  TST     (SP)+
 1247  003556  012600                        MOV     (SP)+,R0
 1248  003560  112102        IFLEQR: MOVB    (R1)+,R2
 1249  003562  120227  000242                CMPB    R2,#,THEN
 1250  003566  001403                        BEQ     .+10
 1251  003570  120227  000205                CMPB    R2,#,GOTO
 1252  003574  001013                        BNE     ERRSX7
```

```
1253  003576  120027  000244                    CMPB    R0,#,LE
1254  003602  001522                            BEQ     GOTO
1255  003604  120027  000246                    CMPB    R0,#,GE
1256  003610  001517                            BEQ     GOTO
1257  003612  120027  000254                    CMPB    R0,#,EQ
1258  003616  001514                            BEQ     GOTO
1259  003620  000167  177110                    JMP     IGNORE
1260  003624  000167  006714          ERRSX7:   JMP     ERRSX9
1261  003630  002456                  IFCOMP:   BLT     IFSGT
1262  003632  005726                            TST     (SP)+
1263  003634  012600                            MOV     (SP)+,R0
1264  003636  000425                            BR      IFLLTR
1265  003640  121127  000244          IFNUMER:  CMPB    (R1),#,LE
1266  003644  103767                            BLO     ERRSX7
1267  003646  121127  000254                    CMPB    (R1),#,EQ
1268  003652  101364                            BHI     ERRSX7
1269  003654  020604                            CMP     SP,R4
1270  003656  103437                            BLO     ERRPD3
1271  003660  016546  000042                    MOV     FAC2(R5),-(SP)
1272  003664  016546  000040                    MOV     FAC1(R5),-(SP)
1273  003670  112146                            MOVB    (R1)+,-(SP)
1274  003672  004767  005504                    JSR     PC,EVAL
1275
1276                                            .IFNDF  $NOSTK
1277  003676  103431                            BCS     ERRMX4
1278                                            .ENDC
1279
1280  003700  012600                            MOV     (SP)+,R0
1281  003702  004767  015542                    JSR     PC,SUBSTK
1282  003706  001724                            BEQ     IFLEQR
1283  003710  002430                            BLT     IFLGTR
1284  003712  112102                  IFLLTR:   MOVB    (R1)+,R2
1285  003714  120227  000242                    CMPB    R2,#,THEN
1286  003720  001403                            BEQ     .+10
1287  003722  120227  000205                    CMPB    R2,#,GOTO
1288  003726  001110                            BNE     ERRSX6
1289  003730  120027  000244                    CMPB    R0,#,LE
1290  003734  001445                            BEQ     GOTO
1291  003736  120027  000252                    CMPB    R0,#,LT
1292  003742  001442                            BEQ     GOTO
1293  003744  120027  000250                    CMPB    R0,#,NE
1294  003750  001437                            BEQ     GOTO
1295  003752  000167  176764                    JMP     IGNORE
1296  003756  000167  006010          ERRPD3:   JMP     ERRPDL
1297
1298                                            .IFNDF  $NOSTK
1299  003762  000167  007024          ERRMX4:   JMP     ERRMIX
1300                                            .ENDC
1301
1302  003766  005726                  IFSGT:    TST     (SP)+
1303  003770  012600                            MOV     (SP)+,R0
1304  003772  112102                  IFLGTR:   MOVB    (R1)+,R2
1305  003774  120227  000242                    CMPB    R2,#,THEN
1306  004000  001403                            BEQ     .+10
1307  004002  120227  000205                    CMPB    R2,#,GOTO
```



```
1308  004006  001060                            BNE     ERRSX6
1309  004010  120027  000246                    CMPB    R0,#,GE
1310  004014  001415                            BEQ     GOTO
1311  004016  120027  000253                    CMPB    R0,#,GT
1312  004022  001412                            BEQ     GOTO
1313  004024  120027  000250                    CMPB    R0,#,NE
1314  004030  001407                            BEQ     GOTO
1315  004032  000167  176704                    JMP     IGNORE
1316  004036  012775  177777  000004  RESTORE:  MOV     #-1,@PDL(R5)
1317  004044  000167  176676                    JMP     EXECUTE
1318
```

```
1319                                    ; 'GOSUB' AND 'GOTO' STATEMENTS
1320                                    GOSUB:
1321  004050  004767  010700            GOTO:   JSR     PC,FLINE
1322  004054  103435                            BCS     ERRSX0
1323  004056  122127  000201                    CMPB    (R1)+,#,EOL
1324  004062  001032                            BNE     ERRSX0
1325  004064  005712                            TST     (R2)
1326  004066  001425                            BEQ     ERRGO
1327  004070  126127  177774  000204            CMPB    -4(R1),#,GOSUB
1328  004076  001013                            BNE     GONOSAV
1329  004100  016503  000032                    MOV     GSBCTR(R5),R3
1330  004104  006303                            ASL     R3
1331  004106  066503  000004                    ADD     POL(R5),R3
1332  004112  020365  000002                    CMP     R3,LIMIT(R5)
1333  004116  101006                            BHI     ERRDEEP
1334  004120  010113                            MOV     R1,(R3)
1335  004122  005265  000032                    INC     GSBCTR(R5)
1336  004126  011201                    GONOSAV:MOV     (R2),R1
1337  004130  000167  176612                    JMP     EXECUTE
1338  004134  000004                    ERRDEEP:IOT
1339                                            .IFNDF  $LONGER
1340  004136  047107      104                   .ASCII  \GND\
1341                                            .ENDC
1342                                            .IFDF   $LONGER
1343                                            .ASCII  'GOSUBS NESTED TOO DEEPLY'
1344                                            .ENDC
1345  004141      000                           .BYTE 0
1346                                            .EVEN
1347  004142  000004                    ERRGO:  IOT
1348                                            .IFNDF  $LONGER
1349  004144  046125      116                   .ASCII  \ULN\
1350                                            .ENDC
1351                                            .IFDF   $LONGER
1352                                            .ASCII  'UNDEFINED LINE NUMBER'
1353                                            .ENDC
1354  004147      000                           .BYTE 0
1355                                            .EVEN
1356  004150  000167  006370            ERRSX6: JMP     ERRSX5
1357
```



```
1358                                    ; 'RETURN' STATEMENT
1359  004154  122127  000201            RETURN: CMPB    (R1)+,#,EOL
1360  004160  001373                            BNE     ERRSX0
1361  004162  016503  000032                    MOV     GSBCTR(R5),R3
1362  004166  020327  000033                    CMP     R3,#33
1363  004172  001415                            BEQ     ERRRET
1364  004174  005303                            DEC     R3
1365  004176  010365  000032                    MOV     R3,GSBCTR(R5)
1366  004202  006303                            ASL     R3
1367  004204  066503  000004                    ADD     POL(R5),R3
1368  004210  005713                            TST     (R3)
1369  004212  001405                            BEQ     ERRRET
1370  004214  011301                            MOV     (R3),R1
1371  004216  000167  176524                    JMP     EXECUTE
1372
1373                                            .IFNDF  $NOSTR
1374  004222  000167  006564            ERRMX5: JMP     ERRMIX
1375                                            .ENDC
1376
1377  004226  000004                    ERRRET: IOT
1378                                            .IFNDF  $LONGER
1379  004230  041122      107                   .ASCII  \RBG\
1380                                            .ENDC
1381                                            .IFDF   $LONGER
1382                                            .ASCII  'RETURN BEFORE GOSUB'
1383                                            .ENDC
1384  004233      000                           .BYTE 0
1385                                            .EVEN
1386
1387                                    ; 'FOR' STATEMENT
1388  004234  010146                    FOR:    MOV     R1,-(SP)
1389  004236  005316                            DEC     (SP)            ;(LOC OF THE 'FOR')
1390  004240  112102                            MOVB    (R1)+,R2
1391  004242  100742                            BMI     ERRSX0
1392  004244  000302                            SWAB    R2
1393  004246  152102                            BISB    (R1)+,R2
1394  004250  061502                            ADD     (R5),R2
1395  004252  021227  177777                    CMP     (R2),#,SVAR
1396  004256  001734                            BEQ     ERRSX0
1397  004260  122127  000254                    CMPB    (R1)+,#,EQ
1398  004264  001331                            BNE     ERRSX0
1399  004266  010265  000022                    MOV     R2,VARSAV(R5)   ;(VAR OF THE FOR)
1400  004272  004767  005104                    JSR     PC,EVAL
1401
1402                                            .IFNDF  $NOSTR
1403  004276  103751                            BCS     ERRMX5
1404                                            .ENDC
1405
1406  004300  012765  177777  000024            MOV     #-1,SS1SAV(R5)  ;FORCE TO SCALAR,
1407  004306  004767  014742                    JSR     PC,STOVAR
1408  004312  122127  000240                    CMPB    (R1)+,#,TO
1409  004316  001314                            BNE     ERRSX0
1410  004320  004767  005056                    JSR     PC,EVAL
1411
1412                                            .IFNDF  $NOSTR
```

```
 1413  004324  103736                          BCS     ERRMX5
 1414                                          ;ENDC
 1415
 1416  004326  016565  000040  000024          MOV     FAC1(R5),SS1SAV(R5)
 1417  004334  016565  000042  000026          MOV     FAC2(R5),SS2SAV(R5);(LIMIT OF THE FOR)
 1418  004342  005065  000040                  CLR     FAC1(R5)
 1419  004346  012765  000001  000042          MOV     #1,FAC2(R5)     ;ASSUMED STEP IS 1.0
 1420  004354  121127  000201                  CMPB    (R1),#,EOL
 1421  004360  001411                          BEQ     FORONE
 1422  004362  122127  000241                  CMPB    (R1)+,#,STEP
 1423  004366  001270                          BNE     ERRSX0
 1424  004370  004767  005006                  JSR     PC,EVAL         ;(FAC HAS THE STEP)
 1425
 1426                                          ;IFNDF  $NOSTK
 1427  004374  103712                          BCS     ERRMX5
 1428                                          ;ENDC
 1429
 1430  004376  121127  000201                  CMPB    (R1),#,EOL
 1431  004402  001262                          BNE     ERRSX0
 1432  004404  005201          FORONE: INC     R1
 1433  004406  016503  000030                  MOV     LINENO(R5),R3
 1434  004412  000402                          BR      FORLOOK
 1435  004414  004767  014550  FORSKIP:JSR     PC,SKIPEOL
 1436  004420  111102          FORLOOK:MOVB    (R1),R2
 1437  004422  100410                          BMI     FORNOL
 1438  004424  005201                          INC     R1
 1439  004426  000302                          SWAB    R2
 1440  004430  152102                          BISB    (R1)+,R2
 1441  004432  061502                          ADD     (R5),R2
 1442  004434  021227  177775                  CMP     (R2),#,SCALAR
 1443  004440  103001                          BHIS    FORNOL
 1444  004442  011203                          MOV     (R2),R3         ;(THE LINENO WHILE LOOKING)
 1445  004444  121127  000225          FORNOL: CMPB    (R1),#,EOF
 1446  004450  001420                          BEQ     ERR4WO
 1447  004452  121127  000211                  CMPB    (R1),#,NEXT     ;THE CODE IS NOW BEING SEARCHED
 1448  004456  001420                          BEQ     FORNEXT         ;FORWARD FROM THE 'FOR' FOR A NEXT WITH
 1449  004460  121127  000203                  CMPB    (R1),#,FOR      ;THE SAME VAR, IF 'EOF' OR ANOTHER 'FOR'
 1450  004464  001353                          BNE     FORSKIP         ;WITH THE SAME VAR IS FOUND FIRST;ERROR,
 1451  004466  005201                          INC     R1
 1452  004470  111102                          MOVB    (R1),R2
 1453  004472  100750                          BMI     FORSKIP
 1454  004474  005201                          INC     R1
 1455  004476  000302                          SWAB    R2
 1456  004500  152102                          BISB    (R1)+,R2
 1457  004502  061502                          ADD     (R5),R2
 1458  004504  020265  000022                  CMP     R2,VARSAV(R5)
 1459  004510  001341                          BNE     FORSKIP
 1460  004512  000004          ERR4WO: IOT
 1461                                          ;IFNDF  $LONGER
 1462  004514  053506     116                  ;ASCII  'FWN'
 1463                                          ;ENDC
 1464                                          ;IFDF   $LONGER
 1465                                          ;ASCII  'FOR WITHOUT NEXT'
 1466                                          ;ENDC
 1467  004517     000                          ;BYTE 2
```



```
 1468                                          ;EVEN
 1469  004520  062701  000013          FORNEXT:ADD     #13,R1
 1470  004524  111102                          MOVB    (R1),R2
 1471  004526  100732                          BMI     FORSKIP
 1472  004530  005201                          INC     R1
 1473  004532  000302                          SWAB    R2
 1474  004534  152102                          BISB    (R1)+,R2
 1475  004536  061502                          ADD     (R5),R2
 1476  004540  020265  000022                  CMP     R2,VARSAV(R5)
 1477  004544  001323                          BNE     FORSKIP
 1478  004546  121127  000201                  CMPB    (R1),#,EOL
 1479  004552  001050                          BNE     ERSX10
 1480  004554  162701  000014                  SUB     #14,R1
 1481  004560  116621  000001                  MOVB    1(SP),(R1)+     ;PUT ADDR OF THE 'FOR' AFTER THE 'NEXT',
 1482  004564  111621                          MOVB    (SP),(R1)+      ;(THATS WHAT THE 2+4+4 BYTES ARE FOR)
 1483  004566  116521  000025                  MOVB    SS1SAV+1(R5),(R1)+;PUT THE LIMIT AFTER THAT,
 1484  004572  116521  000024                  MOVB    SS1SAV(R5),(R1)+
 1485  004576  116521  000027                  MOVB    SS2SAV+1(R5),(R1)+
 1486  004602  116521  000026                  MOVB    SS2SAV(R5),(R1)+
 1487  004606  116521  000041                  MOVB    FAC1+1(R5),(R1)+        ;PUT THE STEP AFTER THAT,
 1488  004612  116521  000040                  MOVB    FAC1(R5),(R1)+
 1489  004616  116521  000043                  MOVB    FAC2+1(R5),(R1)+
 1490  004622  116521  000042                  MOVB    FAC2(R5),(R1)+
 1491  004626  010316                          MOV     R3,(SP)         ;PUT THE SEARCH LINENO ON THE STACK,
 1492  004630  016546  000040                  MOV     FAC1(R5),-(SP)  ;PUT SGN(STEP) ON THE STACK,
 1493  004634  001002                          BNE     .+6
 1494  004636  016516  000042                  MOV     FAC2(R5),(SP)
 1495  004642  016546  000026                  MOV     SS2SAV(R5),-(SP)        ;PUT THE LIMIT ON THE STACK,
 1496  004646  016546  000024                  MOV     SS1SAV(R5),-(SP)
 1497  004652  004767  004524                  JSR     PC,EVAL         ;GET THE CURRENT VALUE OF THE INDEX,
 1498  004656  004767  014566                  JSR     PC,SUBSTK       ;SUBTRACT THE LIMIT,
 1499  004662  001421                          BEQ     FORGOGO
 1500  004664  100405                          BMI     FORLTLM
 1501  004666  005726          FORGTLMI:TST    (SP)+
 1502  004670  100417                          BMI     FORGO
 1503  004672  000404                          BR      FORZERO
 1504  004674  000167  005644  ERSX10: JMP     ERRSX5
 1505  004700  005726          FORLTLMI:TST    (SP)+
 1506  004702  100012                          BPL     FORGO
 1507  004704  012665  000030  FORZERO:MOV     (SP)+,LINENO(R5)
 1508  004710  105061  177764                  CLRB    -14(R1)
 1509  004714  105061  177765                  CLRB    -13(R1)
 1510  004720  005201                          INC     R1
 1511  004722  000167  176020                  JMP     EXECUTE
 1512  004726  005726          FORGOGO:TST     (SP)+
 1513  004730  005726          FORGO:  TST     (SP)+
 1514  004732  116146  177765                  MOVB    -13(R1),-(SP)
 1515  004736  116166  177764  000001          MOVB    -14(R1),1(SP)
 1516  004744  012601                          MOV     (SP)+,R1
 1517  004746  000167  175770                  JMP     IGNORE
 1518                                          ;EOT
 1519
```

```
1520                                    ;                                       SOURCE FILE #3
1521                                    ; 'NEXT' STATEMENT
1522  004752  005002                   NEXT1:  CLR     R2
1523  004754  152102                           BISB    (R1)+,R2
1524  004756  000302                           SWAB    R2
1525  004760  152102                           BISB    (R1)+,R2
1526  004762  020265  000014                   CMP     R2,LOFREE(R5)   ;JUST TO PREVENT AN NXM TRAP,
1527  004766  103131                           BHIS    ERRNEXT
1528  004770  122227  000203                   CMPB    (R2)+,#,FOR
1529  004774  001126                           BNE     ERRNEXT
1530  004776  062701  000010                   ADD     #10,R1
1531  005002  112103                           MOVB    (R1)+,R3
1532  005004  100525                           BMI     ERRSX2
1533  005006  000303                           SWAB    R3
1534  005010  151103                           BISB    (R1),R3
1535  005012  061503                           ADD     (R5),R3
1536  005014  005301                           DEC     R1
1537  005016  122122                           CMPB    (R1)+,(R2)+
1538  005020  001114                           BNE     ERRNEXT
1539  005022  121122                           CMPB    (R1),(R2)+
1540  005024  001112                           BNE     ERRNEXT
1541  005026  121227  000254                   CMPB    (R2),#,EQ
1542  005032  001107                           BNE     ERRNEXT
1543  005034  010365  000022                   MOV     R3,VARSAV(R5)   ;SAVE VARIABLE ADDRESS,
1544  005040  021327  177777                   CMP     (R3),#,SVAR
1545  005044  001505                           BEQ     ERRSX2
1546  005046  022327  177775                   CMP     (R3)+,#,SCALAR
1547  005052  001401                           BEQ     .+4
1548  005054  011303                           MOV     (R3),R3
1549  005056  012365  000040                   MOV     (R3)+,FAC1(R5)  ;PUT THE FOR VAR VALUE INTO FAC,
1550  005062  011365  000042                   MOV     (R3),FAC2(R5)
1551  005066  005301                           DEC     R1
1552  005070  114146                           MOVB    -(R1),-(SP)     ;PUT STEP ON THE STACK,
1553  005072  114166  000001                   MOVB    -(R1),1(SP)
1554  005076  114146                           MOVB    -(R1),-(SP)
1555  005100  114166  000001                   MOVB    -(R1),1(SP)
1556  005104  011665  000026                   MOV     (SP),SS2SAV(R5) ;SAVE SGN(STEP),
1557  005110  001003                           BNE     .+10
1558  005112  016665  000002  000026           MOV     2(SP),SS2SAV(R5)
1559  005120  004767  002476                   JSR     PC,ADDSTK
1560  005124  016546  000042                   MOV     FAC2(R5),-(SP)
1561  005130  016546  000040                   MOV     FAC1(R5),-(SP)
1562  005134  114146                           MOVB    -(R1),-(SP)
1563  005136  114166  000001                   MOVB    -(R1),1(SP)
1564  005142  114146                           MOVB    -(R1),-(SP)
1565  005144  114166  000001                   MOVB    -(R1),1(SP)
1566  005150  004767  014274                   JSR     PC,SUBSTK
1567  005154  001417                           BEQ     NEXGO
1568  005156  100404                           BMI     NEXLTLM
1569  005160  005765  000026           NEXGTLM:TST     SS2SAV(R5)
1570  005164  100413                           BMI     NEXGO
1571  005166  000403                           BR      NEXEND
1572  005170  005765  000026           NEXLTLM:TST     SS2SAV(R5)
1573  005174  100007                           BPL     NEXGO
1574  005176  105041                   NEXEND: CLRB    -(R1)
```



```
1575  005200  105041                           CLRB    -(R1)
1576  005202  062701  000015                   ADD     #15,R1
1577  005206  022626                           CMP     (SP)+,(SP)+     ;THROW AWAY INCREMENTED INDEX,
1578  005210  000167  175532                   JMP     EXECUTE
1579  005214  114146                   NEXGO:  MOVB    -(R1),-(SP)
1580  005216  114166  000001                   MOVB    -(R1),1(SP)
1581  005222  012601                           MOV     (SP)+,R1
1582  005224  012665  000040                   MOV     (SP)+,FAC1(R5)  ;STORE THE INCREMENTED INDEX,
1583  005230  012665  000042                   MOV     (SP)+,FAC2(R5)
1584  005234  012765  177777  000024           MOV     #-1,SS1SAV(R5)
1585  005242  004767  014006                   JSR     PC,STOVAR
1586  005246  000167  175470                   JMP     IGNORE
1587  005252  000004                   ERRNEXT:IOT
1588                                            .IFNDF  $LONGER
1589  005254  041116     106                    .ASCII  \NBF\
1590                                            .ENDC
1591                                            .IFDF   $LONGER
1592                                            .ASCII  'NEXT BEFORE FOR'
1593                                            .ENDC
1594  005257     000                            .BYTE 0
1595                                            .EVEN
1596  005260  000167  005260           ERRSX2: JMP     ERRSX2
1597
```

```
                                        ; 'PRINT' STATEMENT
005264 121127 000261          PRINT:    CMPB    (R1),#,POUND    ;IS IT 'PRINT #N! ...'?
005270 001016                           BNE     PRNT01
005272 005201                           INC     R1
005274 004767 003410                    JSR     PC,CHKOSET      ;CHECK CHANNEL AND SET-UP I/O
005300 005702                           TST     R2              ;DEVICE CODE
005302 001403                           BEQ     COLONCH
005304 016265 005406 000034             MOV     TABL5(R2),COLUMN(R5)    ;NON-TTY COLUMN COUNT
005312 121127 000201          COLONCH:  CMPB    (R1),#,EOL      ;DON'T NEED COLON IF NOTHING
005316 001403                           BEQ     PRNT01          ;  FOLLOWS NUMBER
005320 122127 000260                    CMPB    (R1)+,#,COLON
005324 001355                           BNE     ERRSX2
005326 121127 000243          PRNT01:   CMPB    (R1),#,COMMA
005332 001453                           BEQ     PRICM
005334 121127 000236                    CMPB    (R1),#,SEMI
005340 001453                           BEQ     PRIBOTH
005342 121127 000201                    CMPB    (R1),#,EOL
005346 001450                           BEQ     PRIBOTH

                                        .IFDF   $NOSTR
                                        CMPB    (R1),#,SQUOT    ;CHECK PRINT STRING
                                        BEQ     PRISTR
                                        CMPB    (R1),#,DQUOT
                                        BEQ     PRISTR
                                        CMPB    (R1),#,TAB      ;OR TAB FUNCTION
                                        BEQ     PRITB
                                        .ENDC

005350 004767 004026                    JSR     PC,EVAL

                                        .IFNDF  $NOSTR
005354 103417                           BCS     PRISTR
                                        .ENDC

005356 027527 000034 000074             CMP     @COLUMN(R5),#74
005364 101402                           BLOS    .+6
005366 004767 000240                    JSR     PC,PRINCR
005372 004767 012340                    JSR     PC,NUMSGN
005376 020706                           .WORD   PUTCHAR
005400 004167 012074                    JSR     R1,MSGODEV
005404    040                           .ASCII  ' '
005405    000                           .BYTE   0
                                        .EVEN
005406 000430                           BR      PRIBOTH

        005406                  TABL5   *=.+2
005410 000400                           .       CLMNPP
005412 000402                           .       CLMNLP


                                        .IFNDF  $NOSTR
005414 012602                 PRISTR:   MOV     (SP)+,R2
005416 005202                           INC     R2
005420 001423                           BEQ     PRIBOTH
```

202


```
005422 005003                           CLR     R3
005424 154203                           BISB    -(R2),R3
005426 062702 000003                    ADD     #3,R2
005432 027527 000034 000110   PRILOOP:  CMP     @COLUMN(R5),#110
005440 103402                           BLO     .+6
005442 004767 000164                    JSR     PC,PRINCR
005446 112200                           MOVB    (R2)+,R0
005450 004767 013232                    JSR     PC,PUTCHAR
005454 005303                           DEC     R3
005456 003365                           BGT     PRILOOP
005460 000403                           BR      PRIBOTH
                                        .ENDC

005462 004167 012012          PRICM:    JSR     R1,MSGODEV
005466    040    000                    .BYTE   SL,0
005470 121127 000201          PRIBOTH:  CMPB    (R1),#,EOL
005474 001003                           BNE     PRIMORE
005476 004767 000130                    JSR     PC,PRINCR
005502 000441                           BR      PRIJMP
005504 122127 000243          PRIMORE:  CMPB    (R1)+,#,COMMA
005510 001027                           BNE     PRISEMI
005512 017500 000034          PRICOMM:  MOV     @COLUMN(R5),R0
005516 001430                           BEQ     PRITEST
005520 020027 000070                    CMP     R0,#70
005524 001425                           BEQ     PRITEST
005526 103403                           BLO     .+10
005530 004767 000076                    JSR     PC,PRINCR
005534 000421                           BR      PRITEST
005536 020027 000052                    CMP     R0,#52
005542 001416                           BEQ     PRITEST
005544 020027 000034                    CMP     R0,#34
005550 001413                           BEQ     PRITEST
005552 020027 000016                    CMP     R0,#16
005556 001410                           BEQ     PRITEST
005560 004167 011714                    JSR     R1,MSGODEV
005564    040                           .ASCII  ' '
005565    000                           .BYTE   0
                                        .EVEN
005566 000751                           BR      PRICOMM
005570 124127 000236          PRISEMI:  CMPB    -(R1),#,SEMI
005574 001254                           BNE     PRNT01
005576 005201                           INC     R1
005600 121127 000201          PRITEST:  CMPB    (R1),#,EOL
005604 001250                           BNE     PRNT01
005606 005201                 PRIJMP:   INC     R1
005610 012765 000036 000034             MOV     #CLMNTTY,COLUMN(R5)     ;RE-SET TO TTY COLUMN COUNT
005616 060565 000034                    ADD     R5,COLUMN(R5)
005622 105065 000076                    CLRB    ODEV(R5)
005626 000167 175114                    JMP     EXECUTE


                                        .IFDF   $NOSTR
                              PRISTR:   MOVB    (R1)+,R3        ;SAVE OPEN QUOTE CHAR
                                        CMPB    (R1)+,#,TEXT    ;TEST FOR TEXT BYTE
                              PRISJ:    BNE     ERRSX2
                              PRIST1:   MOVB    (R1)+,R2        ;GET NEXT CHAR
```

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```
1708                                            BEQ     PRIST1
1709                                            CMPB    R2,R3           ;CHECK CLOSE QUOTE
1710                                            BEQ     PRIBOTH
1711                                            CMPB    R2,#,EOL        ;CHECK END LINE
1712                                            BEQ     ERRSX2
1713                                            CMP     @COLUMN(R5),#110
1714                                            BLO     .+6
1715                                            JSR     PC,PRINCR
1716                                            MOV     R2,R0
1717                                            JSR     PC,PUTCHAR
1718                                            BR      PRIST1
1719
1720                                    PRITB1: TSTB    (R1)+
1721                                            JSR     PC,EVAL
1722                                            JSR     PC,INT
1723                                            CMPB    (R1)+,#,RPAR
1724                                            BNE     PRISJ
1725                                            MOVB    FAC2(R5),R2     ;GET FN VALUE
1726                                            SUB     @COLUMN(R5),R2  ;COMPUTE # SPACES
1727                                    PRITB0: CMP     R2,#72.
1728                                            BLO     PRITB1
1729                                            SUB     #72.,R2
1730                                            BR      PRITB0
1731                                    PRITB1: DEC     R2
1732                                            BMI     PRIBOTH
1733                                            MOV     #8.,R0
1734                                            JSR     PC,PUTCHAR
1735                                            BR      PRITB1
1736                                            .ENDC
1737                                    ;
1738  005632  004167  011642           PRINCR: JSR     R1,MSG0DEV
1739  005636     015     012                    .BYTE   CR,LF
1740  005640     000                            .BYTE 0
1741          005642                            .EVEN
1742  005642  005075  000034                    CLR     @COLUMN(R5)
1743  005646  000207                            RTS     PC
1744
1745
```



```
1746                                    ; 'INPUT' STATEMENT
1747  005650  020165  000016           INPUT:  CMP     R1,CODE(R5)
1748  005654  101006                           BHI     INPYES
1749  005656  004167  011902                   JSR     R1,MSGERR
1750                                           .IFNDF  $LONGER
1751  005662  046111     116                   .ASCII  \ILN\
1752                                           .ENDC
1753                                           .IFDF   $LONGER
1754                                           .ASCII  'ILLEGAL NOW'
1755                                           .ENDC
1756  005665     000                           .BYTE 0
1757                                           .EVEN
1758  005666  000167  173314                   JMP     READY2
1759  005672  105065  000002           INPYES: CLRB    T3(R5)
1760  005676  105065  000077                   CLRB    IDEV(R5)        ;RESET INPUT TO TTY
1761  005702  121127  000261                   CMPB    (R1),#,POUND    ;IS IT 'INPUT #N'...?
1762  005706  001010                           BNE     INPY01
1763  005710  105265  000002                   INCB    T3(R5)
1764  005714  005201                           INC     R1
1765  005716  004767  002760                   JSR     PC,CHKISET      ;CHECK CHANNEL AND SET-UP INPUT
1766  005722  122127  000260                   CMPB    (R1)+,#,COLON
1767  005726  001150                           BNE     ERRSX0
1768  005730  010746           INPY01: MOV     PC,-(SP)
1769  005732  062716  000416           INPPC:  ADD     #INPEOL-INPPC,(SP)
1770  005736  112102           INPLOOP:MOVB    (R1)+,R2
1771  005740  100543                           BMI     ERRSX0
1772  005742  000302                           SWAB    R2
1773  005744  152102                           BISB    (R1)+,R2
1774  005746  061502                           ADD     (R5),R2
1775  005750  004767  007410                   JSR     PC,GETVAR
1776  005754  011603           INPRTRY:MOV     (SP),R3
1777  005756  121327  000201                   CMPB    (R3),#,EOL
1778  005762  001053                           BNE     INPOK
1779  005764  105765  000002           INPNEW: TSTB    T3(R5)
1780  005770  001003                           BNE     NOQM
1781  005772  004167  011454                   JSR     R1,MSG
1782  005776     077                           .ASCII  '?'
1783  005777     000                           .BYTE 0
1784                                           .EVEN
1785  006000  010146           NOQM:   MOV     R1,-(SP)
1786  006002  004767  010126                   JSR     PC,LINGET
1787  006006  103002                           BCC     NOQM1
1788  006010  000167  000512                   JMP     ERRDATA
1789  006014  012601           NOQM1:  MOV     (SP)+,R1
1790  006016  016502  000022                   MOV     VARSAV(R5),R2
1791
1792                                           .IFNDF  $NOSTR
1793  006022  021227  177777                   CMP     (R2),#,SVAR
1794  006026  001512                           BEQ     INPSTR
1795                                           .ENDC
1796
1797  006030  010146                           MOV     R1,-(SP)
1798  006032  010446                           MOV     R4,-(SP)
1799  006034  016501  000020                   MOV     LINE(R5),R1
1800  006040  122127  000015                   CMPB    (R1)+,#CR
```

```
 1801  006044  001375                          BNE     .+4
 1802  006046  010104                          MOV     R1,R4
 1803  006050  005204                          INC     R4
 1804  006052  020465  000016                  CMP     R4,CODE(R5)
 1805  006056  101135                          BHI     ERRTR8
 1806  006060  114144                          MOVB    *(R1)+,*(4)
 1807  006062  020165  000020                  CMP     R1,LINE(R5)
 1808  006066  101374                          BHI     .+6
 1809  006070  112711  000054                  MOVB    #',,(R1)
 1810  006074  004767  013412                  JSR     PC,TRAN
 1811  006100  012604                          MOV     (SP)+,R4
 1812  006102  012601                          MOV     (SP)+,R1
 1813  006104  016516  000020                  MOV     LINE(R5),(SP)
 1814  006110  000721                          BR      INPRTRY
 1815  006112  016502  000022          INPOK1  MOV     VARSAV(R5),R2
 1816
 1817                                          .IFNDF  $NOSTR
 1818  006116  021227  177777                  CMP     (R2),#,SVAR
 1819  006122  001720                          BEQ     INPNEW
 1820                                          .ENDC
 1821
 1822  006124  005203                          INC     R3
 1823  006126  005065  000040                  CLR     FAC1(R5)
 1824  006132  005065  000042                  CLR     FAC2(R5)
 1825  006136  121327  000243                  CMPB    (R3)+,#,COMMA
 1826  006142  001403                          BEQ     INPSTO
 1827  006144  004767  010104                  JSR     PC,LITEVAL
 1828  006150  000431                          BR      INPNGUD
 1829  006152  010316          INPSTO1 MOV     R3,(SP)
 1830  006154  004767  013074                  JSR     PC,STOVAR
 1831  006160  011603                          MOV     (SP),R3
 1832  006162  121327  000243                  CMPB    (R3)+,#,COMMA
 1833  006166  001403                          BEQ     INPGOOD
 1834  006170  121327  000201                  CMPB    (R3)+,#,EOL
 1835  006174  001017                          BNE     INPNGUD
 1836  006176  122127  000243          INPGOOD1CMPB    (R1)+,#,COMMA
 1837  006202  001655                          BEQ     INPLOOP
 1838  006204  126127  177777  000201  INPEND1 CMPB    -1(R1),#,EOL
 1839  006212  001016                          BNE     ERRSX8
 1840  006214  005726                          TST     (SP)+
 1841  006216  105765  000077                  TSTB    IDEV(R5)        ;IF TTY INPUT, CLR COLUMN COUNT
 1842  006222  001002                          BNE     GOEXEC
 1843  006224  005065  000036                  CLR     CLMNTTY(R5)     ;  FOR SAME
 1844  006230  000167  174512          GOEXEC1 JMP     EXECUTE
 1845  006234  004167  011204          INPNGUD1JSR     R1,MSGERR
 1846                                          .IFNDF  $LONGER
 1847  006240  051102     124                  .ASCII  \BRT\
 1848                                          .ENDC
 1849                                          .IFDF   $LONGER
 1850                                          .ASCII  'BAD DATA-RETYPE FROM ERROR,'
 1851                                          .ENDC
 1852  006243     015     012                  .BYTE   CR,LF
 1853  006245     000                          .BYTE   0
 1854                                          .EVEN
 1855  006246  000646                          BR      INPNEW
```

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```
 1856  006250  000167  004270          ERRSX81 JMP     ERRSX5
 1857
 1858                                          .IFNDF  $NOSTR
 1859  006254  016503  000020          INPSTR1 MOV     LINE(R5),R3
 1860  006260  010302                          MOV     R3,R2
 1861  006262  122327  000015                  CMPB    (R3)+,#CR
 1862  006266  001375                          BNE     .+4
 1863  006270  010246                          MOV     R2,-(SP)
 1864  006272  162716  000003                  SUB     #3,(SP)
 1865  006276  010346                          MOV     R3,-(SP)
 1866  006300  160216                          SUB     R2,(SP)
 1867  006302  005316                          DEC     (SP)
 1868  006304  001416                          BEQ     INPNULL
 1869  006306  010602                          MOV     SP,R2
 1870  006310  062702  000002                  ADD     #2,R2
 1871  006314  004767  010732                  JSR     PC,MAKESTR
 1872  006320  004767  013010          INPNNUL1JSR     PC,STOSVAR
 1873  006324  005726                          TST     (SP)+
 1874  006326  122127  000243                  CMPB    (R1)+,#,COMMA
 1875  006332  001324                          BNE     INPEND
 1876  006334  005726                          TST     (SP)+
 1877  006336  000167  177366                  JMP     INPY01
 1878  006342  012716  177777          INPNULL1MOV     #-1,(SP)
 1879  006346  000764                          BR      INPNNUL
 1880                                          .ENDC
 1881
 1882  006350  000201          INPEOL1 .WORD   .EOL
 1883  006352  000167  013616          ERRTR81 JMP     ERRTRN
 1884
```

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```
 1885                                           ; 'READ' STATEMENT
 1886  006356  112102                 READ:   MOVB    (R1)+,R2
 1887  006360  100733                         BMI     ERRSX0
 1888  006362  000302                         SWAB    R2
 1889  006364  152102                         BISB    (R1)+,R2
 1890  006366  061502                         ADD     (R5),R2
 1891  006370  004767  006770                JSR     PC,GETVAR
 1892  006374  017503  000004                MOV     @PDL(R5),R3
 1893  006400  001452                         BEQ     ERRDATA
 1894  006402  020327  177777                CMP     R3,#-1
 1895  006406  001457                         BEQ     REASRCH
 1896  006410  121327  000201                CMPB    (R3),#,EOL
 1897  006414  001456                         BEQ     REAFIND
 1898  006416  122327  000243                CMPB    (R3)+,#,COMMA
 1899  006422  001044                         BNE     READBAD
 1900  006424  111302                 READGOT:MOVB    (R3),R2
 1901
 1902                                           .IFNDF  $NOSTR
 1903  006426  120227  000256                CMPB    R2,#,DQUOTE
 1904  006432  001470                         BEQ     READQT
 1905  006434  120227  000257                CMPB    R2,#,SQUOTE
 1906  006440  001465                         BEQ     READQT
 1907                                           .ENDC
 1908
 1909  006442  004767  007006                JSR     PC,LITEVAL
 1910  006446  000432                         BR      READBAD
 1911  006450  010346                         MOV     R3,-(SP)
 1912  006452  004767  012570                JSR     PC,STOVAR
 1913  006456  012603                 READDUN:MOV     (SP)+,R3
 1914  006460  121327  000201                CMPB    (R3),#,EOL
 1915  006464  001403                         BEQ     .+10
 1916  006466  121327  000243                CMPB    (R3),#,COMMA
 1917  006472  001020                         BNE     READBAD
 1918  006474  010375  000004                MOV     R3,@PDL(R5)
 1919  006500  122127  000243                CMPB    (R1)+,#,COMMA
 1920  006504  001724                         BEQ     READ
 1921  006506  126127  177777  000201        CMPB    -1(R1),#,EOL
 1922  006514  001255                         BNE     ERRSX0
 1923  006516  000167  174224                JMP     EXECUTE
 1924  006522  005075  000004        READOUT:CLR     @PDL(R5)
 1925  006526  000004                 ERRDATA:IOT
 1926                                           .IFNDF  $LONGER
 1927  006530  047517      104                 .ASCII  \OOD\
 1928                                           .ENDC
 1929                                           .IFDF   $LONGER
 1930                                           .ASCII  'OUT OF DATA'
 1931                                           .ENDC
 1932  006533      000                         .BYTE 0
 1933                                           .EVEN
 1934  006534  005075  000004        READBAD:CLR     @PDL(R5)
 1935  006540  000004                         IOT
 1936                                           .IFNDF  $LONGER
 1937  006542  042102      122                 .ASCII  \BDR\
 1938                                           .ENDC
 1939                                           .IFDF   $LONGER
```

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```
 1940                                           .ASCII  'BAD DATA READ'
 1941                                           .ENDC
 1942  006545      000                         .BYTE 0
 1943                                           .EVEN
 1944  006546  016503  000016        REASRCH:MOV     CODE(R5),R3
 1945  006552  105713                REAFIND:TSTB    (R3)
 1946  006554  100402                         BMI     .+6
 1947  006556  062703  000002                ADD     #2,R3
 1948  006562  122327  000223                CMPB    (R3)+,#,DATA
 1949  006566  001716                         BEQ     READGOT
 1950  006570  124327  000225                CMPB    -(R3),#,EOF
 1951  006574  001752                         BEQ     READOUT
 1952  006576  010146                         MOV     R1,-(SP)
 1953  006600  010301                         MOV     R3,R1
 1954  006602  004767  012302                JSR     PC,SKIPEOL
 1955  006606  010103                         MOV     R1,R3
 1956  006610  012601                         MOV     (SP)+,R1
 1957  006612  000757                         BR      REAFIND
 1958
 1959                                           .IFNDF  $NOSTR
 1960  006614  005203                READQT: INC     R3
 1961  006616  122327  000377                CMPB    (R3)+,#,TEXT
 1962  006622  001344                         BNE     READBAD
 1963  006624  010300                         MOV     R3,R0
 1964  006626  105723                         TSTB    (R3)+
 1965  006630  001376                         BNE     .-2
 1966  006632  122302                         CMPB    (R3)+,R2
 1967  006634  001337                         BNE     READBAD
 1968  006636  010346                         MOV     R3,-(SP)
 1969  006640  010046                         MOV     R0,-(SP)
 1970  006642  162716  000003                SUB     #3,(SP)
 1971  006646  010602                         MOV     SP,R2
 1972  006650  010346                         MOV     R3,-(SP)
 1973  006652  160016                         SUB     R0,(SP)
 1974  006654  162716  000002                SUB     #2,(SP)
 1975  006660  001413                         BEQ     REANULL
 1976  006662  004767  010364                JSR     PC,MAKESTR
 1977  006666  012603                         MOV     (SP)+,R3
 1978  006670  010316                         MOV     R3,(SP)
 1979  006672  010600                         MOV     SP,R0
 1980  006674  062703  000003                ADD     #3,R3
 1981  006700  110043                         MOVB    R0,-(R3)
 1982  006702  000300                         SWAB    R0
 1983  006704  110043                         MOVB    R0,-(R3)
 1984  006706  000402                         BR      READSTR
 1985  006710  005316                REANULL:DEC     (SP)
 1986  006712  012616                         MOV     (SP)+,(SP)
 1987  006714  004767  012414        READSTR:JSR     PC,STOSVAR
 1988  006720  000656                         BR      READDUN
 1989                                           .ENDC
 1990
 1991
```

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```
                                        ;*****************************************************
                                        ;*****************************************************
                                        ;*************                          **************
                                        ;*************   INTERUPT HANDLERS      **************
                                        ;*************                          **************
                                        ;*****************************************************
                                        ;*****************************************************


                                        ;
                                        ; KBINT - KEYBOARD INTERUPT SERVICE
                                        ;
                                        ;  PASS ANY CHAR, TO BUFF, EXCEPT 000 (IGNORE)
                                        ;   AND 003 (^C'), SET FLAG FOR LATER ACTION,)
                                        ;   IF BUFF, FULL, IGNORE CHAR BUT ECHO BELL,
                                        ;
000722  004567  012134          KBINT:  JSR     R5,SAVRGI       ;CAUSE RTI ON REG, RESTORE
000726  016705  000000G                 MOV     USRAREA,R5
000732  016501  000102                  MOV     KBHD(R5),R1     ;KB BUFF, HDR,
000736  012704  177564                  MOV     #TPS,R4
000742  113700  177562                  MOVB    @#TKB,R0        ;GET THAT CHAR,
000746  042700  177600                  BIC     #177600,R0
000752  001442                          BEQ     KBIDUN          ;IGNORE 000
000754  120027  000003                  CMPB    R0,#003         ;^C'?
000760  001005                          BNE     KBCO
000762  105265  000100                  INCB    CNCFLG(R5)      ;MARK ^C' HIT
000766  004767  001516                  JSR     PC,BUFCLR       ;CLEAR ALL BUFFERS
000772  000410                          BR      DOPUT
000774  120027  000017          KBCO:   CMPB    R0,#17          ;CHECK ^O'
001000  001005                          BNE     DOPUT
001002  105165  000107                  COMB    CNOFLG(R5)
001006  001402                          BEQ     DOPUT           ;IF PRINT RESTORED,BYPASS
001010  004767  001550                  JSR     PC,BUFTP        ;CLEAR TELEPRINTER BUFFER
001014  004767  011574          DOPUT:  JSR     PC,PUTBYT
001020  103017                          BCC     KBIDUN          ;GOT IN
001022  105761  000012                  TSTB    BFSPEC(R1)
001026  001003                          BNE     S,0101
001030  110861  000012                  MOVB    R0,BFSPEC(R1)
001034  000207                          RTS     PC
001036  105714          S,0101: TSTB    (R4)            ;NO ROOM! DO BELL
001040  100376                          BPL     S,0101
001042  042714  000100                  BIC     #100,(R4)       ;TEMP, CLR, INTER,
001046  112737  000007  177566          MOVB    #007,@#TPB      ;INSERT BELL
001054  105714          S,0102: TSTB    (R4)            ;WAIT UNTIL DONE
001056  100376                          BPL     S,0102
001060  012737  000101  177560  KBIDUN: MOV     #101,@#TKS      ;RE-INIT, READER
001066  012714  000100                  MOV     #100,(R4)       ;ENAPLE TPIR, FOR ECHO
001072  000207                          RTS     PC              ;WILL RESTORE REGS, AND RTI
```

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```
                                        ;
                                        ; TPINT - TELEPRINTER INTERUPT HANDLER
                                        ;
                                        ;  USED TO PRINT OUT TEXT AND ECHO TYPE-IN,
                                        ;  TO HANDLE CASE OF PENDING REQUESTS TO DO TEXT OUTPUT
                                        ;   AND ECHO, DOES THE ORDERLY THING BY FOLLOWING THIS
                                        ;   PRIORITY!
                                        ;       IF ECHOSP(R5) SHOWS NEED TO DO 2ND HALF OF PAIRED
                                        ;        CHARS, FOR ECHO (^U, <CR><LF>), DO FIRST,
                                        ;       IF TEXT MESS, IN PROGRESS, FINISH IT (TO <LF>),
                                        ;       ELSE, ECHO,
                                        ;       ELSE, TURN OFF INTERUPTS,
                                        ;
007074  004567  011762          TPINT:  JSR     R5,SAVRGI       ;CAUSE RTI ON REG, RESTORE
007100  016705  000000G                 MOV     USRAREA,R5
007104  105765  000110                  TSTB    FILLCO(R5)
007110  001404                          BEQ     TPNXT
007112  105365  000110                  DECB    FILLCO(R5)
007116  005000                          CLR     R0
007120  000416                          BR      TYPE1
007122  012704  000104          TPNXT:  MOV     #ECHOSP,R4
007126  060504                          ADD     R5,R4           ;SAVED HERE THRU-OUT ROUTINE
007130  005714                          TST     (R4)            ;SPECIAL ECHO IN PROGRESS?
007132  001415                          BEQ     TRYECHO         ;NO
007134  113400          SPECHES:MOVB    @(R4)+,R0       ;NEXT SP, ECHO CHAR,
007136  001412                          BEQ     CLRECHO
007140  005244                          INC     -(R4)           ;PT, TO NEXT CHAR,
007142  120065  000112                  CMPB    R0,FILLCH(R5)
007146  001003                          BNE     TYPE1
007150  116565  000111  000110          MOVB    FILLNO(R5),FILLCO(R5)
007156  110037  177566          TYPE1:  MOVB    R0,@#TPB
007162  000207                          RTS     PC              ;RESTORE REGS, AND RETURN
007164  005044          CLRECHO:CLR     -(R4)
007166  016501  000102          TRYECHO:MOV     KBHD(R5),R1     ;NO MESS, - ECHO?

007172  004767  005752                  JSR     PC,GETZBYT
007176  103011                          BCC     GOTECHO
007200  016501  000100          MSGSUP: MOV     TPHD(R5),R1     ;TRY MESSAGE
007204  004767  005740                  JSR     PC,GETZBYT
007210  103354                          BCC     TYPE            ;GOT ONE! GO DO IT
007212  042737  000100  177564  OFFTYPE:BIC     #100,@#TPS      ;CLEAR INTERUPT
007220  000207                          RTS     PC

007222  004367  001354          GOTECHO:JSR     R3,CHKCHR       ;CHECK THAT ECHO CHAR,
007226  000420                          BR      PRNTDEL         ;LINE DELETE
007230  000422                          BR      SETLFE          ;<CR>: <LF> AS ECHOSP
007232  000424                          BR      ECHOBA          ;RUB OUT! DO "<"
007234  000401                          BR      TPCN
007236  000741                          BR      TYPE

007240  120027  000003          TPCN:   CMPB    R0,#3           ;CHEC ^C'
007244  001003                          BNE     TPCO
007246  012714  007325                  MOV     #CCMES,(R4)
007252  700730                          BR      SPECHES
007254  120027  000017          TPCO:   CMPB    R0,#17          ;CHECK ^O'
007260  001342                          BNE     TRYECHO
```

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```
2097  007262  012714  007330                  MOV     #COMES,(R4)
2098  007266  000722                          BR      SPECMES
2099                                  ;
2100  007270  012714  007312          PRNTDEL:MOV *   #DELMSG,(R4)    ;ST, ANDR, INTO ECHOSP(R5)
2101  007274  000717                          BR      SPECMES
2102                                  ;
2103  007276  012714  007322          SETLFE: MOV     #CRLFMES,(R4)
2104  007302  000714                          BR      SPECMES
2105                                  ;
2106  007304  112700  000137          ECHOBA: MOVB    #'-,R0
2107  007310  000714                          BR      TYPE
2108                                  ;
2109                                  DELMSG:
2110  007312  042040  046105  052105           ,ASCII  ' DELETED'
      007320  042105
2111  007322     015     012     000  CRLFMES:,BYTE   015,012,000
2112  007325     136     103          COMES:  ,ASCII  '^C'
2113  007327     000                          ,BYTE 0
2114  007330  047536                  COMES:  ,ASCII  '^O'
2115  007332     015     012     000          ,BYTE   015,012,000
2116          007336                          ,EVEN
2117
```

212


```
2118                                            ,IFNDF  SNOPTP
2119                                  ;
2120                                  ; PTRINT - PAPER-TAPE READER INTERUPT HANDLER
2121                                  ;
2122                                  ;  CLEARS PARITY BIT,  FLUSHES 000, RUB-OUT, AND <LF>;
2123                                  ;  IF CHAR; WON'T FIT IN BUFF;, SAVE IN BFSPEC (LO BYTE),
2124                                  ;  ON EOT OR OTHER ERROR, SET HI BIT OF BFSPEC,
2125                                  ;
2126  007336  004567  011520          PTRINT: JSR     R5,SAVRGI       ;CAUSE RTI ON REG, RESTORE
2127  007342  012701  023714                  MOV     #PRBFHD,R1      ;FOR PUTBYT
2128  007346  005737  177550                  TST     @#PRS           ;ERRORS?
2129  007352  100425                          BMI     PREOT           ;YES; TREAT AS EOT
2130  007354  113700  177552                  MOVB    @#PRB,R0        ;CHARACTER
2131  007360  042700  177000                  BIC     #177600,R0
2132  007364  001414                          BEQ     EXITP2          ;IGNORE 000 (CAN'T HAPPEN!)
2133  007366  122700  000177                  CMPB    #177,R0         ;RUB OUT?
2134  007372  001411                          BEQ     EXITP2          ;IGNORE
2135  007374  122700  000012                  CMPB    #LF,R0
2136  007400  001406                          BEQ     EXITP2          ;IGNORE LF'S
2137  007402  004767  011206                  JSR     PC,PUTBYT
2138  007406  103003                          BCC     EXITP2          ;GOT IN
2139  007410  110061  000012                  MOVB    R0,BFSPEC(R1)   ;SAVE THIS CHAR,
2140  007414  000207                          RTS     PC              ;RESTORE REGS, AND RTI
2141  007416  012737  000101  177550  EXITP2: MOV     #101,@#PRS      ;RE-ENABLE READER
2142  007424  000207                          RTS     PC
2143  007426  052761  100000  000012  PREOT: BIS     #100000,BFSPEC(R1)      ;SHOW EOT
2144  007434  000207                          RTS     PC
2145                                          ,ENDC
2146
```

213

```
                                        .IFNDF  $NOPTP
                                ;
                                ; PPINT - PAPER TAPE PUNCH INTERUPT HANDLER
                                ;
                                ;  ON ERROR, MAKE BFSPEC NON-0,
                                ;
007436  004567  011420          PPINT:  JSR     R5,SAVRGI       ;CAUSE RTI AFTER REG, RESTORE
007442  016705  000000G                  MOV     USRAREA,R5
007446  012701  023760                   MOV     #PPBFHD,R1
007452  005737  177554                   TST     @#PPS
007456  100406                          BMI     PPERR
007460  004767  005456                   JSR     PC,GET1BYT
007464  103406                          BCS     NOCHR2          ;NOTHING TO GET
007466  110037  177556                   MOVB    R0,@#PPB
007472  000207                          RTS     PC              ;RESTORE REGS, AND RTI
007474  052761  000001  000012  PPERR:  BIS     #1,BFSPEC(R1)   ;'INDIC' ERROR
007502  005037  177554          NOCHR2: CLR     @#PPS           ;CLEAR INTERUPT ENABLE
007506  000207                          RTS     PC
                                ;
                                        .ENDC
```

214


```
                                        .IFNDF  $NOLPI
                                ;
                                ; LPINT - LINE PRINTER INTERUPT HANDLER
                                ;
007510  004567  011346          LPINT:  JSR     R5,SAVRGI       ;CAUSE RTI AFTER REG, RESTORE
007514  016705  000000G                  MOV     USRAREA,R5
007520  012701  024024                   MOV     #LPBFHD,R1
007524  005737  177514                   TST     @#LPS
007530  100406                          BMI     LPERR
007532  004767  005404                   JSR     PC,GET1BYT
007536  103406                          BCS     LPOFF           ;NOTHING THERE
007540  110037  177516                   MOVB    R0,@#LPB        ;WRITE CHAR
007544  000207                          RTS     PC
                                ;
007546  052761  000001  000012  LPERR:  BIS     #1,BFSPEC(R1)   ;RECORD ERROR
007554  005037  177514          LPOFF:  CLR     @#LPS           ;TURN IT OFF FOR AWHILE
007560  000207                          RTS     PC
                                        .ENDC
```

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```
2188                                            .IFNDF  $NOPOW
2189                                    ;
2190                                    ; POWDWN - POWER FAIL/RESTART ROUTINE
2191                                    ;
2192  007562  012737  007572  000024  POWDWN: MOV     #POWUP,@#24
2193  007570  000000                          HALT
2194                                    ;
2195  007572  005000                  POWUP:  CLR     R0          ;INITIALIZE LOOP COUNT
2196  007574  016705  000000G         POWLP:  MOV     USRAREA,R5
2197  007600  012737  007562  000024          MOV     #POWDWN,@#24
2198  007606  016506  000004                  MOV     PDL(R5),SP      ;WASTE TIME (AND INIT STACK!)
2199  007612  005300                          DEC     R0              ;COUNT TILL DONE
2200  007614  001367                          BNE     POWLP
2201  007616  000167  171316                  JMP     READY@
2202                                          .ENDC
2203                                          .EOT
2204
```

216


```
2205                                    ;                               SOURCE FILE #4
2206                                    ;*****************************************************
2207                                    ;*****************************************************
2208                                    ;***********                                ***********
2209                                    ;***********      CLOSED SUBROUTINES        ***********
2210                                    ;***********                                ***********
2211                                    ;*****************************************************
2212                                    ;*****************************************************
2213
2214
2215
2216
2217
2218                                    ;*-------------------------------------------------
2219                                    ;  SUBROUTINE 'ADDSTK'  CALLED BY JSP PC
2220                                    ;                       ADDS (SP)+,(SP)+ TO FAC1(R5),FAC2(R5) WATCHING TYPE
2221                                    ;                       R0,R1  UNUSED
2222                                    ;                       R2,R3  DESTROYED
2223                                    ;                       R4  MODIFIED TO REFLECT STACK USAGE
2224                                    ;                       R5  MUST POINT TO USER AREA
2225                                    ;                       SP  GOES ?? DEEPER AFTER JSR
2226  007622  012603                  ADDSTK: MOV     (SP)+,R3
2227  007624  004767  005124                  JSR     PC,FIXUP
2228  007630  001414                          BEQ     ADDINT
2229  007632  012767  013214  000000G         MOV     #ERADD,$ERVEC
2230  007640  004467  005250                  JSR     R4,FPPSAV
2231  007644  016046                          ,WORD   PUSH
2232  007646  000000G                         ,WORD   $ADR
2233  007650  016060                          ,WORD   POP
2234  007652  015066                          ,WORD   FPPRES
2235  007654  005765  000040                  TST     FAC1(R5)
2236  007660  000113                          JMP     (R3)            ;COND CODES=SGN(RESULT)
2237  007662  005726                  ADDINT: TST     (SP)+
2238  007664  012602                          MOV     (SP)+,R2
2239  007666  066502  000042                  ADD     FAC2(R5),R2
2240  007672  102403                          BVS     ADDOVF
2241  007674  010265  000042                  MOV     R2,FAC2(R5)
2242  007700  000113                          JMP     (R3)            ;COND CODES=SGN(RESULT)
2243  007702  100425                  ADDOVF: BMI     ADDPOS
2244  007704  001416                          BEQ     ADDZERO
2245  007706  005402                          NEG     R2
2246  007710  105065  000042                  CLRB    FAC2(R5)
2247  007714  110265  000043                  MOVB    R2,FAC2+1(R5)
2248  007720  000302                          SWAB    R2
2249  007722  110265  000040                  MOVB    R2,FAC1(R5)
2250  007726  105065  000041                  CLRB    FAC1+1(R5)
2251  007732  062765  143600  000040          ADD     #143600,FAC1(R5)
2252  007740  000113                          JMP     (R3)            ;COND CODES=SGN(RESULT)
2253  007742  005065  000042          ADDZERO:CLR     FAC2(R5)
2254  007746  012765  144200  000040          MOV     #144200,FAC1(R5)
2255  007754  000113                          JMP     (R3)            ;COND CODES=SGN(RESULT)
2256  007756  105065  000042          ADDPOS: CLRB    FAC2(R5)
2257  007762  110265  000043                  MOVB    R2,FAC2+1(R5)
2258  007766  000302                          SWAB    R2
2259  007770  110265  000040                  MOVB    R2,FAC1(R5)
```

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```
 2260  007774  105065  000041                  CLRB    FAC1+1(R5)
 2261  010000  062765  043600  000040          ADD     #43600,FAC1(R5)
 2262  010006  000113                          JMP     (R3)            ;COND CODES=SGN(RESULT)
 2263
```

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```
 2264                                   ;*************************************************
 2265                                   ;  SUBROUTINE 'ALLOC'   CALLED BY JSR PC
 2266                                   ;                      ALLOCATES ARRAY SPACE FROM FREESPACE
 2267                                   ;                      R0,R1  PRESERVED
 2268                                   ;                      R2  MUST POINT TO VAR    GETS DESTROYED
 2269                                   ;                      R3  MUST CONTAIN SS1MAX   GETS DESTROYED
 2270                                   ;                      R4  MUST CONTAIN SS2MAX    GETS DESTROYED
 2271                                   ;                      R5  MUST POINT TO USER AREA
 2272                                   ;                      SP  GOES ?? DEEPER AFTER JSR
 2273  010010  010046                  ALLOC:  MOV     R0,-(SP)
 2274  010012  010146                          MOV     R1,-(SP)
 2275  010014  005203                          INC     R3
 2276  010016  010401                          MOV     R4,R1
 2277  010020  005201                          INC     R1
 2278  010022  201776                          BEQ     .-2
 2279  010024  005000                          CLR     R0                      ;****
 2280  010026  012746  000020                  MOV     #20.,-(SP)              ;*  *
 2281  010032  006301                  ALLLOOP:ASL     R1                      ;*  *
 2282  010034  103002                          BCC     ALLNOAD                 ;*  *
 2283  010036  060300                          ADD     R3,R0                   ;*  *  MULTIPLY (R1)*(R3)*2
 2284  010040  103505                          BCS     ERRARAY                 ;*  *  RESULT IN R0
 2285  010042  006300                  ALLNOAD:ASL     R0                      ;*  *  WATCH FOR OVERFLOWS
 2286  010044  103503                          BCS     ERRARAY                 ;*  *
 2287  010046  005316                          DEC     (SP)                    ;*  *
 2288  010050  003370                          BGT     ALLLOOP                 ;*  *
 2289  010052  005726                          TST     (SP)+                   ;****
 2290  010054  062700  000002                  ADD     #2,R0
 2291  010060  103475                          BCS     ERRARAY         ;R0 NOW = 2 TIMES # ELEMENTS NEEDED,
 2292
 2293                                          .IFNDF  $NOSTR
 2294  010062  021227  177777                  CMP     (R2),#,SVAR
 2295  010066  001402                          BEQ     .+6
 2296                                          .ENDC
 2297
 2298  010070  006300                          ASL     R0
 2299  010072  103470                          BCS     ERRARAY         ;R0 NOW = # BYTES NEEDED,
 2300  010074  016501  000012                  MOV     HIFREE(R5),R1
 2301  010100  160001                          SUB     R0,R1
 2302  010102  103464                          BCS     ERRARAY
 2303  010104  020165  000074                  CMP     R1,HISTR(R5)
 2304  010110  103461                          BLO     ERRARAY
 2305  010112  005721                          TST     (R1)+
 2306  010114  000401                          BR      .+4
 2307  010116  005021                          CLR     (R1)+
 2308  010120  020165  000012                  CMP     R1,HIFREE(R5)
 2309  010124  101774                          BLOS    .-6
 2310  010126  160001                          SUB     R0,R1
 2311
 2312                                          .IFNDF  $NOSTR
 2313  010130  021227  177777                  CMP     (R2),#,SVAR
 2314  010134  001413                          BEQ     ALLSTRN
 2315                                          .ENDC
 2316
 2317  010136  012722  177776                  MOV     #,NVAR,(R2)+
 2318  010142  012221                          MOV     (R2)+,(R1)+
```

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```
 2319  010144  012221                          MOV     (R2)+,(R1)+
 2320  010146  010412                          MOV     R4,(R2)
 2321  010150  005303                          DEC     R3
 2322  010152  010342                          MOV     R3,-(R2)
 2323  010154  010142                          MOV     R1,-(R2)
 2324  010156  162712  000004                  SUB     #4,(R2)
 2325
 2326                                          .IFNDF  $NOSTR
 2327  010162  000427                          BR      ALLEXIT
 2328  010164  005722                  ALLSTRN:TST     (R2)+
 2329  010166  012221                          MOV     (R2)+,(R1)+
 2330  010170  005303                          DEC     R3
 2331  010172  010322                          MOV     R3,(R2)+
 2332  010174  010412                          MOV     R4,(R2)
 2333  010176  010162  177774                  MOV     R1,-4(R2)
 2334  010202  162762  000002  177774          SUB     #2,-4(R2)
 2335  010210  012721  177777                  MOV     #-1,(R1)+
 2336  010214  020165  000012                  CMP     R1,HIFREE(R5)
 2337  010220  101773                          BLOS    .-10
 2338  010222  160001                          SUB     R0,R1
 2339  010224  011102                          MOV     (R1),R2
 2340  010226  005202                          INC     R2
 2341  010230  001404                          BEQ     ALLEXIT
 2342  010232  000301                          SWAB    R1
 2343  010234  110122                          MOVB    R1,(R2)+
 2344  010236  000301                          SWAB    R1
 2345  010240  110112                          MOVB    R1,(R2)
 2346                                          .ENDC
 2347
 2348  010242  160065  000012          ALLEXIT:SUB     R0,HIFREE(R5)
 2349  010246  012601                          MOV     (SP)+,R1
 2350  010250  012600                          MOV     (SP)+,R0
 2351  010252  000207                          RTS     PC
 2352  010254  000004                  ERRARAY:IOT
 2353                                          .IFNDF  $LONGER
 2354  010256  052101     114                  .ASCII  \ATL\
 2355                                          .ENDC
 2356                                          .IFDF   $LONGER
 2357                                          .ASCII  'ARRAYS TOO LARGE'
 2358                                          .ENDC
 2359  010261     000                          .BYTE   0
 2360                                          .EVEN
 2361
```

220


```
 2362                                          .IFNDF  $NOSTR
 2363                                  ;+-------+-------+-------+-------+-------+-------+-------+-------
 2364                                  ; 'ARGB' SUBROUTINE
 2365                                  ;                               CALLED BY JSR R7
 2366                                  ;                               CALLS EVAL TO GET A 1-BYTE
 2367                                  ;                               ARGUMENT, BRANCHES TO ERRARG
 2368                                  ;                               IF ARG NO GOOD
 2369  010262  004767  001114          ARGB:   JSR     PC,EVAL
 2370  010266  103411                          BCS     ERRARG
 2371  010270  004767  005300                  JSR     PC,INT
 2372  010274  005765  000040                  TST     FAC1(R5)
 2373  010300  001004                          BNE     ERRARG
 2374  010302  105765  000043                  TSTB    FAC2+1(R5)
 2375  010306  001001                          BNE     ERRARG
 2376  010310  000207                          RTS     PC
 2377                                          .ENDC
 2378
 2379                                  ERSQR:
 2380                                  ERLOG:
 2381  010312  000004                  ERRARG: IOT
 2382                                          .IFDF   $LONGER
 2383                                          .ASCII  'ARGUMENT ERROR'
 2384                                          .ENDC
 2385                                          .IFNDF  $LONGER
 2386  010314  051101     107                  .ASCII  'ARG'
 2387                                          .ENDC
 2388  010317     000                          .BYTE   0
 2389                                          .EVEN
 2390
```

221

```
                                        ;+----------+----------+----------+----------+----------+----------+----------+----------+
                                        ;  SUBROUTINE TBOMB    CALLED BY IOT
                                        ;                      PRINTS ERROR MESSAGE FROM AFTER IOT
                                        ;                      R0  DESTROYED
                                        ;                      R1  PRESERVED
                                        ;                      R2,R3,R4  UNUSED
                                        ;                      R5  MUST POINT TO USER AREA
                                        ;                      SP  RESET TO EMPTY STACK
                                        ;                      PC  DOES NOT RETURN
010320  011601                  BOMB:   MOV     (SP),R1
010322  016705  000000G                 MOV     USRAREA,R5
010326  016506  000004                  MOV     PDL(R5),SP
010332  005065  000076                  CLR     ODEV(R5)        ;CAUSE MES OUTPUT TO TTY
010336  012765  000036  000034          MOV     #CLMNTTY,COLUMN(R5)     ;SET-UP TTY FOR COL. COUNT
010344  060565  000034                  ADD     R5,COLUMN(R5)
010350  004167  007076                  JSR     R1,MSG
010354      015     012                 .BYTE   CR,LF
                                        .IFNDF  $LONGER
010356      045                         .ASCII  /%/
                                        .ENDC
010357      000                         .BYTE 0
                                        .EVEN
010360  112100                  BOMBNX: MOVB    (R1)+,R0
010362  001403                          BEQ     BOMBDON
010364  004767  010316                  JSR     PC,PUTCHAR
010370  000773                          BR      BOMBNX
010372  026527  000030  177775  BOMBDON:CMP     LINENO(R5),#-1,SCALAR
010400  103041                          BHIS    BOMBJMP
010402  004167  007044                  JSR     R1,MSG
010406  040440  020124  044514          .ASCII  ' AT LINE '
010414  042516      040
010417      000                         .BYTE 0
                                        .EVEN
010420  016500  000030                  MOV     LINENO(R5),R0
010424  002405                          BLT     BOMBNEG
010426  010065  000042                  MOV     R0,FAC2(R5)
010432  005065  000040                  CLR     FAC1(R5)
010436  000414                          BR      BOMBOK
010440  110065  000043          BOMBNEG:MOVB    R0,FAC2+1(R5)
010444  105065  000042                  CLRB    FAC2(R5)
010450  000300                          SWAB    R0
010452  110065  000040                  MOVB    R0,FAC1(R5)
010456  105065  000041                  CLRB    FAC1+1(R5)
010462  062765  043600  000040          ADD     #43600,FAC1(R5)
010470  004767  007230          BOMBOK: JSR     PC,NUMOUT
010474  004167  006752                  JSR     R1,MSG
010500      015     012     000         .BYTE   CR,LF,0
                        010504          .EVEN
010504  000167  170434          BOMBJMP:JMP     READY
```

222


```
                                        ;
                                        ; BUFCLR--INIT I/O DEV, BUFFER HEADERS
                                        ;
                                        ; CALL: JSR     PC,BUFCLR
                                        ;
                                        ; USES R2 AND R3
                                        ;
010510  016502  000102          BUFCLR: MOV     KBHD(R5),R2     ;KEYBOARD
010514  012203                          MOV     (R2)+,R3        ;BUFF. START
010516  005722                          TST     (R2)+           ;SKIP TO BGET1
010520  010322                          MOV     R3,(R2)+
010522  010322                          MOV     R3,(R2)+
010524  010322                          MOV     R3,(R2)+
010526  004767  000032                  JSR     PC,BUFTP        ;CLEAR TELEPRINTER BUFFER
                                        .IFNDF  $NOPTP
010532  012702  023760                  MOV     #PPBFHD,R2      ;PAPER TAPE PUNCH
010536  004767  004774                  JSR     PC,INITBF
010542  012702  023714                  MOV     #PRBFHD,R2      ;PAPER TAPE READER
010546  004767  004764                  JSR     PC,INITBF
                                        .ENDC
                                        .IFNDF  $NOLPT
010552  012702  024024                  MOV     #LPBFHD,R2
010556  004767  004754                  JSR     PC,INITBF
                                        .ENDC

010562  000207                          RTS     PC


                                        ;
                                        ; BUFTP--INIT TELEPRINTER BUFFER HEADER
                                        ;
                                        ; CALL: JSR     PC,BUFTP
                                        ;
                                        ; USES R2 AND R3
                                        ;
010564  016502  000100          BUFTP:  MOV     TPHD(R5),R2     ;TELEPRINTER
010570  012203                          MOV     (R2)+,R3        ;BUFF. START
010572  022222                          CMP     (R2)+,(R2)+     ;PT. TO BGET2
010574  010322                          MOV     R3,(R2)+
010576  010322                          MOV     R3,(R2)+
010600  000207                          RTS     PC
```

223

```
                                        ;
                                        ;
                                        ; CHKCHR - CHECK ASCII CHAR, FOR SPECIAL CASES
                                        ;
                                        ; CALL: MOV     @CHAR,R0
                                        ;       JSR     R3,CHKCHR
                                        ;       INSTRUC,        ;EXECUTE IF LINE DEL, (<ALT MODE>,'U')
                                        ;       INSTRUC,        ;EXEC. IF <CR>
                                        ;       INSTRUC,        ;EXEC. IF <RUB OUT> (OR '?')
                                        ;       INSTRUC,        ;EXEC. IF BELOW 40 OR ABOVE 137
                                        ;       INSTRUC,        ;EXEC. IF GOOD STUFF
                                        ;
                                        ;  USES R0
                                        ;
010602  120027  000176          CHKCHR: CMPB    R0,#176         ;ALT MODE
010606  001434                          BEQ     CCEXIT
010610  120027  000175                  CMPB    R0,#175         ;ALT MODE
010614  001431                          BEQ     CCEXIT
010616  120027  000033                  CMPB    R0,#33          ;ALT MODE
010622  001426                          BEQ     CCEXIT
010624  120027  000025                  CMPB    R0,#25          ;'U'
010630  001423                          BEQ     CCEXIT
010632  005723                          TST     (R3)+           ;TO <CR> RETURN
010634  120027  000015                  CMPB    R0,#CR
010640  001417                          BEQ     CCEXIT
010642  005723                          TST     (R3)+           ;TO RUB OUT RETURN
010644  120027  000177                  CMPB    R0,#177         ;RUB OUT
010650  001413                          BEQ     CCEXIT
010652  120027  000137                  CMPB    R0,#'_
010656  001410                          BEQ     CCEXIT
010660  005723                          TST     (R3)+           ;TO LIMIT RETURN
010662  120027  000040                  CMPB    R0,#40
010666  103404                          BLO     CCEXIT
010670  120027  000137                  CMPB    R0,#137
010674  101001                          BHI     CCEXIT
010676  005723                          TST     (R3)+           ;REG, CHAR, RETURN
010700  000203          CCEXIT: RTS     R3
```

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```
                                        ;
                                        ; CHKISET - CHECK I/O CHANNEL AND SET-UP INPUT (IDEV(R5))
                                        ; CHKOSET - CHECK I/O CHANNEL AND SET-UP OUTPUT (ODEV(R5))
                                        ;
                                        ; CALL: MOV     @ADDR, OF CODE LINE PTR, AFTER '#(),R1
                                        ;       JSR     PC,CHKISET (CHKOSET)
                                        ;
                                        ;  USES: R0,R1,R2,R3,R5
                                        ;
                                        ;  CHECK IF SPECIFIED CHANNEL LEGAL (NUMBER IN RANGE AND I/O
                                        ;   DEVICE ASSEMBLED IN),  RETURN CODE FOR SPECIFIED DEVICE
                                        ;   (SAME AS VALUE OF IDEV (ODEV)) IN R2,  ON EXIT, R1 PTS
                                        ;   TO BYTE AFTER CHANNEL NUMBER.
                                        ;
010702  012700  010777          CHKISET:MOV     #ITABLE,R0
010706  000402                          BR      COMCHK
010710  012700  010774          CHKOSET:MOV     #OTABLE,R0
010714  004767  000462          COMCHK: JSR     PC,EVAL
010720  103420                          BCS     ERSX12
010722  005765  000040                  TST     FAC1(R5)
010726  001017                          BNE     ERCHAN          ;MUST BE INTEGER
010730  016502  000042                  MOV     FAC2(R5),R2
010734  001411                          BEQ     OUT012          ;TTY - EVERYTHING SET-UP
010736  111003                          MOVB    (R0),R3         ;FIRST TABLE ENTRY
010740  060503                          ADD     R5,R3           ;PTS, TO ACTUAL BYTE
010742  020227  000002                  CMP     R2,#2           ;MAX CHANNEL NUMBER (CURRENTLY)
010746  101007                          BHI     ERCHAN
010750  060200                          ADD     R2,R0           ;ENTRY IN TABLE OF DEV, CODE
010752  111013                          MOVB    (R0),(R3)       ;CODE INTO IDEV OR ODEV
010754  001404                          BEQ     ERCHAN          ;MEANS NO DEVICE THERE
010756  111002                          MOVB    (R0),R2
010760  000207          OUT012: RTS     PC
                                        ;
010762  000167  001556          ERSX12: JMP     ERRSX2
                                        ;
010766  000004          ERCHAN: IOT
                                        ,IFNDF  $LONGER
010770  041504     105                  ,ASCII  \DCE\
                                        ,ENDC
                                        ,IFDF   $LONGER
                                        ,ASCII  'DEVICE CHANNEL ERROR'
                                        ,ENDC
010773     000                          ,BYTE   0
                                        ,EVEN
                                        ;
                                        ;
010774     076          OTABLE: ,BYTE   ODEV
                                        ,IFDF   $NOPTP
                                        ,BYTE   0
                                        ,ENDC
                                        ,IFNDF  $NOPTP
010775     002                  ,BYTE   2
                                        ,ENDC
                                        ,IFDF   $NOLPI
                                        ,BYTE   0
```

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```
                                        ,ENDC
                                        ,IFNDF  $NOLPI
010776  004                             ,BYTE   4
                                        ,ENDC
                                ;
010777  077                     ITABLE1 ,BYTE   IQEV
                                        ,IFDF   $NOPTP
                                        ,BYTE   0
                                        ,ENDC
                                        ,IFNDF  $NOPTP
011000  002                             ,BYTE   2
                                        ,ENDC
011001  000                             ,BYTE   0
```

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```
                                ;+----------------------------------------------
                                ;  SUBROUTINE 'CLRVARS' CALLED BY JSP PC
                                ;                       CLEARS VARS TO SCALAR ZEROS,NULL STRINGS
                                ;                       ALSO INITIALIZES RANDOM NO GEN
                                ;                       R0  DESTROYED
                                ;                       R1,R2,R3,R4  UNUSED
                                ;                       R5  MUST POINT TO USER AREA
                                ;                       SP  GOES NO DEEPER AFTER JSR
011002  012765  032331  000064  CLRVARS:MOV     #32331,RND1(R5)
011010  012765  163251  000066          MOV     #163251,RND2(R5)
011016  011500                  CLRLOOP:MOV     (R5),R0
011020  020065  000014                  CMP     R0,LOFREE(R5)
011024  103021                          BHIS    CLRFREE
011026  021027  177775                  CMP     (R0),#,SCALAR
011032  103412                          BLO     CLROK
                                
                                        ,IFNDF  $NOSTR
011034  021027  177777                  CMP     (R0),#,SVAR
011040  001404                          BEQ     CLRSVAR
                                        ,ENDC
                                
011042  012720  177775                  MOV     #,SCALAR,(R0)+
011046  005010                          CLR     (R0)
                                
                                        ,IFNDF  $NOSTR
011050  000401                          BR      ,+4
011052  012010                  CLRSVAR:MOV     (R0)+,(R0)
                                        ,ENDC
                                
011054  012010                          MOV     (R0)+,(R0)
011056  012010                          MOV     (R0)+,(R0)
011060  062700  000004          CLROK:  ADD     #4,R0
011064  000755                          BR      CLRLOOP
011066  005020                          CLR     (R0)+
011070  020065  000010          CLRFREE:CMP     R0,ARRAYS(R5)
011074  101774                          BLOS    ,-6
011076  016565  000010  000012          MOV     ARRAYS(R5),HIFREE(R5)
011104  016565  000014  000072          MOV     LOFREE(R5),LOSTR(R5)
011112  016565  000014  000074          MOV     LOFREE(R5),HISTR(R5)    ;EMPTY STRING STORAGE
011120  012765  000033  000032          MOV     #33,GSBCTR(R5)
011126  016500  000004                  MOV     POL(R5),R0
011132  012720  177777                  MOV     #-1,(R0)+
011136  005020                          CLR     (R0)+
011140  020065  000002                  CMP     R0,LIMIT(R5)
011144  101774                          BLOS    ,-6
011146  000207                          RTS     PC
```

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2637                                    ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++
2638                                    ;  SUBROUTINE 'DIVTEN'  CALLED BY JSR PC
2639                                    ;                       DIVIDES R3,R4 BY DECIMAL 10
2640                                    ;                       R0,R1,R2  UNUSED
2641                                    ;                       R3,R4  IS THE 31 BIT UNSIGNED INTEGER TO DIVIDE
2642                                    ;                       R5  UNUSED
2643                                    ;                       SP  GOES 2 DEEPER AFTER JSR
2644  011150  012746  000034           DIVTEN: MOV     #34,-(SP)
2645  011154  022703  050000           DIVLOOP:CMP     #50000,R3
2646  011160  101002                           BHI     .+6
2647  011162  062703  130000                   ADD     #130000,R3
2648  011166  006104                           ROL     R4
2649  011170  006103                           ROL     R3
2650  011172  005316                           DEC     (SP)
2651  011174  003367                           BGT     DIVLOOP
2652  011176  042703  170000                   BIC     #170000,R3
2653  011202  005726                           TST     (SP)+
2654  011204  000207                           RTS     PC
2655
```

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```
2656                                            .IFNDF  $NOSTR
2657                                    ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++
2658                                    ;  SUBROUTINE 'DNPACK'  CALLED BY JSR PC
2659                                    ;                       PACKS STRING STORAGE TOWARD LOW CORE
2660                                    ;                       R0  UNUSED
2661                                    ;                       R1,R2,R3  PRESERVED
2662                                    ;                       R4  UNUSED
2663                                    ;                       R5  MUST POINT TO USER AREA
2664                                    ;                       SP  GOES 1# DEEPER AFTER JSR
2665  011206  010146                   DNPACK: MOV     R1,-(SP)        ;TO UNDERSTAND THESE ROUTINES IT IS HELPFUL TO
2666  011210  010246                           MOV     R2,-(SP)        ;KNOW THAT NON-NULL STRINGS ARE STORED AS
2667  011212  010346                           MOV     R3,-(SP)        ;(LENGTH,2 BYTE BACKPTR,N BYTE STRING,LENGTH)
2668  011214  005046                           CLR     -(SP)   ;WHERE LENGTH IS THE VALUE OF N AND IF BACKPTR
2669  011216  016502  000072                   MOV     LOSTR(R5),R2    ;IS ODD,THEN IT IS RELATIVE TO SYMBOLS,
2670  011222  016501  000014                   MOV     LOFREE(R5),R1
2671  011226  010165  000072                   MOV     R1,LOSTR(R5)
2672  011232  005016                   DNPLOOP:CLR     (SP)
2673  011234  152216                           BISB    (R2)+,(SP)
2674  011236  001012                           BNE     DNPNZRO
2675  011240  020265  000074           DNPBAD: CMP     R2,HISTR(R5)
2676  011244  103772                           BLO     DNPLOOP
2677  011246  010165  000074                   MOV     R1,HISTR(R5)    ;SAVE HIGH STRING ADDRESS
2678  011252  005726                           TST     (SP)+
2679  011254  012603                           MOV     (SP)+,R3
2680  011256  012602                           MOV     (SP)+,R2
2681  011260  012601                           MOV     (SP)+,R1
2682  011262  000207                           RTS     PC
2683  011264  005003                   DNPNZRO:CLR     R3
2684  011266  152203                           BISB    (R2)+,R3
2685  011270  000303                           SWAB    R3
2686  011272  152203                           BISB    (R2)+,R3
2687  011274  061602                           ADD     (SP),R2
2688  011276  005202                           INC     R2
2689  011300  030327  000001                   BIT     R3,#1
2690  011304  001402                           BEQ     .+6
2691  011306  005303                           DEC     R3
2692  011310  061503                           ADD     (R5),R3
2693  011312  020365  000004                   CMP     R3,PDL(R5)
2694  011316  103390                           BHIS    DNPBAD
2695  011320  020306                           CMP     R3,SP
2696  011322  103013                           BHIS    DNPGOOD
2697  011324  020365  000010                   CMP     R3,ARRAYS(R5)
2698  011330  101343                           BHI     DNPBAD
2699  011332  020365  000012                   CMP     R3,HIFREE(R5)
2700  011336  101005                           BHI     DNPGOOD
2701  011340  020365  000014                   CMP     R3,LOFREE(R5)
2702  011344  103335                           BHIS    DNPBAD
2703  011346  020315                           CMP     R3,(R5)
2704  011350  103733                           BLO     DNPBAD
2705  011352  062716  000004           DNPGOOD:ADD     #4,(SP)
2706  011356  161602                           SUB     (SP),R2
2707  011360  020213                           CMP     R2,(R3)
2708  011362  001005                           BNE     DNPIGNO
2709  011364  010113                           MOV     R1,(R3)
2710  011366  112221                           MOVB    (R2)+,(R1)+
```

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```
2711  011370  005316                        DEC     (SP)
2712  011372  003375                        BGT     ,+4
2713  011374  000721                        BR      ONPBAD
2714  011376  061602              ONPIGNO:  ADD     (SP),R2
2715  011400  000717                        BR      ONPBAD
2716                                        ,ENDC
2717                                        ,EOT
2718
```

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```
2719                                ;                                SOURCE FILE #5
2720                                ;*****************************************************
2721                                ;
2722                                ; EVAL - EVALUATE EXPRESSION
2723                                ;
2724                                ; CALL: MOV     [USER-AREA],R4
2725                                ;       MOV     [STACK SIZE],R4
2726                                ;       MOV     [CHAR. PTR],R1
2727                                ;       JSR     PC,EVAL
2728                                ;
2729                                ;  USES ALL REGS,
2730                                ;
2731                                ;  RETURNS 'C' BIT SET IF STRING VAL,
2732                                ;                  CLR IF NOT STRING
2733                                ;
2734                                ;  RETURNS VALUE IN FAC1(R5), FAC2(R5)
2735                                ;
2736  011402  020604                EVAL:   CMP     SP,R4
2737  011404  103406                        BLO     BPDL
2738  011406  012746  000235               MOV     #,TERM,-(SP)
2739  011412  000404                        BR      OPERAND
2740  011414  012746  000233       UMINUS: MOV     #,UNARY,-(SP)
2741  011420  020604                        CMP     SP,R4
2742  011422  103563                BPDL:   BLO     ERRPDL
2743  011424  112102                OPERAND:MOVB    (R1)+,R2
2744  011426  002141                        BGE     VARBLE
2745  011430  120227  000375               CMPB    R2,#,ILIT1
2746  011434  001475                        BEQ     ILIT1
2747  011436  120227  000376               CMPB    R2,#,ILIT2
2748  011442  001502                        BEQ     ILIT2
2749  011444  120227  000374               CMPB    R2,#,FLIT
2750  011450  001502                        BEQ     FLIT
2751  011452  120227  000255               CMPB    R2,#,LPAR
2752  011456  001510                        BEQ     LPAR
2753  011460  120227  000234               CMPB    R2,#,MINUS
2754  011464  001753                        BEQ     UMINUS
2755  011466  120227  000232               CMPB    R2,#,PLUS
2756  011472  001754                        BEQ     OPERAND
2757  011474  120227  000262               CMPB    R2,#,FN
2758  011500  001537                        BEQ     GOTOFN
2759
2760                                        ,IFNDF  $NOSTR
2761  011502  120227  000257               CMPB    R2,#,$QUOT
2762  011506  001403                        BEQ     GOTOQT
2763  011510  120227  000256               CMPB    R2,#,QQUOT
2764  011514  001002                        BNE     NOQUOTE
2765  011516  000167  001030       GOTOQT: JMP     QUOTE
2766                                        ,ENDC
2767
2768  011522  042702  177400       NOQUOTE:BIC     #177400,R2
2769  011526  162702  000263               SUB     #,RNDL,R2
2770  011532  006302                        ASL     R2
2771  011534  020227  000044               CMP     R2,#TBL5END-TABLE5
2772  011540  101065                        BHI     ERRSX4
2773  011542  062702  000012               ADD     #12,R2
```

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2774  011546  060702                        ADD     PC,R2
2775  011550  005712                        TST     (R2)
2776  011552  303002                        BGT     .+6
2777  011554  000167  002740                JMP     ERRUFN
2778  011560  061227                        ADD     (R2),PC
2779  011562  000000              TABLE5:   .WORD   0                   ; RND(
2780  011564  000000                        .WORD   0                   ; RND
2781  011566  001440                        .WORD   SINFN-TABLE5
2782  011570  001446                        .WORD   COSFN-TABLE5
2783  011572  001454                        .WORD   SQRFN-TABLE5
2784  011574  001470                        .WORD   ATNFN-TABLE5
2785  011576  001476                        .WORD   EXPFN-TABLE5
2786  011600  001512                        .WORD   LOGFN-TABLE5
2787  011602  000000                        .WORD   0                   ; ABS
2788  011604  001662                        .WORD   INTFN-TABLE5
2789  011606  000000                        .WORD   0                   ; SGN
2790
2791                                        .IFNDF  $NOSTR
2792  011610  000000                        .WORD   0                   ; TAB
2793  011612  000000                        .WORD   0                   ; LEN
2794  011614  000000                        .WORD   0                   ; ASC
2795  011616  000000                        .WORD   0                   ; CHR$
2796  011620  000000                        .WORD   0                   ; POS
2797  011622  000000                        .WORD   0                   ; SEG
2798  011624  000000                        .WORD   0                   ; VAL
2799  011626  000000                        .WORD   0                   ; STR
2800                                        .ENDC
2801
2802            011626      TBL5END =.-2
2803  011630  005065  000040  ILIT1:   CLR     FAC1(R5)
2804  011634  105065  000043          CLRB    FAC2+1(R5)
2805  011640  112165  000042          MOVB    (R1)+,FAC2(R5)
2806  011644  000167  000316          JMP     OPRATOR
2807  011650  005065  000040  ILIT2:   CLR     FAC1(R5)
2808  011654  000406                  BR      ILITCOM
2809  011656  112165  000041  FLIT:    MOVB    (R1)+,FAC1+1(R5)
2810  011662  112165  000040          MOVB    (R1)+,FAC1(R5)
2811  011666  112165  000043  ILITCOM: MOVB    (R1)+,FAC2+1(R5)
2812  011672  112165  000042          MOVB    (R1)+,FAC2(R5)
2813  011676  000533                  BR      OPRATOR
2814  011700  004767  177476  LPAR:    JSR     PC,EVAL
2815
2816                                        .IFNDF  $NOSTR
2817  011704  103405                        BCS     LPSTRNG
2818                                        .ENDC
2819
2820  011706  122127  000237                CMPB    (R1)+,#,RPAR
2821  011712  001525                        BEQ     OPRATOR
2822  011714  000167  000624  ERRSX4:  JMP     ERRSX2
2823
2824                                        .IFNDF  $NOSTR
2825  011720  122127  000237  LPSTRNG: CMPB    (R1)+,#,RPAR
2826  011724  001373                        BNE     ERRSX4
2827  011726  000167  000766                JMP     SQPRAIR
2828                                        .ENDC
```

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2829
2830  011732  000302              VARBLE:  SWAB    R2
2831  011734  152102                       BISB    (R1)+,R2
2832  011736  061502                       ADD     (R5),R2             ;COLLECT OFFSET
2833  011740  121127  000255               CMPB    (R1),#,LPAR
2834  011744  001421                       BEQ     VARSS
2835
2836                                        .IFNDF  $NOSTR
2837  011746  021227  177777                CMP     (R2),#,SVAR
2838  011752  001405                       BEQ     STRGJMP
2839                                        .ENDC
2840
2841  011754  022227  177775                CMP     (R2)+,#,SCALAR
2842  011760  001476                       BEQ     VARNOSS
2843  011762  011202                       MOV     (R2),R2
2844  011764  000474                       BR      VARNOSS
2845
2846                                        .IFNDF  $NOSTR
2847  011766  000167  000666  STRGJMP: JMP     STRGVAR
2848                                        .ENDC
2849
2850  011772  000004              ERRPDL:  IOT
2851                                        .IFNDF  $LONGER
2852  011774  052105      103               .ASCII  \ETC\
2853                                        .ENDC
2854                                        .IFDF   $LONGER
2855                                        .ASCII  'EXPRESSION TOO COMPLEX'
2856                                        .ENDC
2857  011777      000                       .BYTE   0
2858                                        .EVEN
2859  012000  000167  002246  GOTOFN:  JMP     FNFN
2860
2861                                        .IFNDF  $NOSTR
2862  012004  000167  001002  ERRMX2:  JMP     ERRMIX
2863                                        .ENDC
2864
2865  012010  005201              VARSS:   INC     R1
2866  012012  003767                       BLE     ERRPDL
2867  012014  010246                       MOV     R2,-(SP)
2868  012016  004767  177360                JSR     PC,EVAL
2869
2870                                        .IFNDF  $NOSTR
2871  012022  103770                       BCS     ERRMX2
2872                                        .ENDC
2873
2874  012024  004767  003544                JSR     PC,INT
2875  012030  005765  000040                TST     FAC1(R5)
2876  012034  001030                       BNE     ERRSS2
2877  012036  121127  000237                CMPB    (R1),#,RPAR
2878  012042  001427                       BEQ     VONESS
2879  012044  122127  000243                CMPB    (R1)+,#,COMMA
2880  012050  001321                       BNE     ERRSX4
2881  012052  016546  000042                MOV     FAC2(R5),-(SP)
2882  012056  004767  177320                JSR     PC,EVAL
2883
```

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                                        .IFNDF  $NOSTK
012062  103750                         BCS     ERRMX2
                                        .ENDC

012064  004767  003504                 JSR     PC,INT
012070  005765  000040                 TST     FAC1(R5)
012074  001010                         BNE     ERRSS2
012076  122127  000237                 CMPB    (R1)+,#,RPAR
012102  001304                         BNE     ERRSX4
012104  016503  000042                 MOV     FAC2(R5),R3
012110  100402                         BMI     ERRSS2
012112  012600                         MOV     (SP)+,R0
012114  000407                         BR      VTWOSS
012116  000167  004454         ERRSS2: JMP     ERRSS3
012122  005201         VONESS: INC     R1
012124  012703  177777                 MOV     #-1,R3
012130  016500  000042                 MOV     FAC2(R5),R0
012134  100770         VTWOSS: BMI     ERRSS2
012136  012602                         MOV     (SP)+,R2

                                        .IFNDF  $NOSTK
012140  021227  177777                 CMP     (R2),#,SVAR
012144  001002                         BNE     .+6
012146  000167  000500                 JMP     STRGAMR
                                        .ENDC

012152  004767  004232                 JSR     PC,LOCGET
012156  012265  000040         VARNOSS: MOV     (R2)+,FAC1(R5)
012162  011265  000042                 MOV     (R2),FAC2(R5)
012166  111103         OPRATOR: MOVB    (R1),R3         ;NEXT CHARACTER,
012170  120327  000201                 CMPB    R3,#,EOL
012174  001437                         BEQ     DOITNOW
012176  120327  000205                 CMPB    R3,#,GOTO
012202  001434                         BEQ     DOITNOW
012204  120327  000227                 CMPB    R3,#,UPARRO
012210  103641                         BLO     ERRSX4
012212  011602                         MOV     (SP),R2         ;PREVIOUS OPERATOR,
012214  120227  000227                 CMPB    R2,#,UPARRO
012220  101425                         BLOS    DOITNOW         ;JUMP IF ^,
012222  120227  000231                 CMPB    R2,#,SLASH
012226  101417                         BLOS    PREC2           ;JUMP IF * OR /,
012230  120227  000234                 CMPB    R2,#,MINUS
012234  101411                         BLOS    PREC3           ;JUMP IF + - OR UNARY,
012236  120227  000254                 CMPB    R2,#,EQ
012242  101403                         BLOS    PREC4           ;JUMP IF = <> <= >= < OR >,
012244  120327  000254         PREC5:  CMPB    R3,#,EQ
012250  101427                         BLOS    NOTNOW          ;JUMP IF ANY OPERATOR,
012252  120327  000234         PREC4:  CMPB    R3,#,MINUS
012256  101424                         BLOS    NOTNOW          ;JUMP IF + - UNARY * / OR ^,
012260  120327  000231         PREC3:  CMPB    R3,#,SLASH
012264  101421                         BLOS    NOTNOW          ;JUMP IF * / OR ^,
012266  120327  000227         PREC2:  CMPB    R3,#,UPARRO
012272  101416                         BLOS    NOTNOW          ;JUMP IF ^,
012274  005002         DOITNOW: CLR    R2                      ;(E,G,  A+B+ ) DO THE * NOW,
012276  152602                         BISB    (SP)+,R2
```

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```
012300  162702  000226                 SUB     #,UPARRO-1,R2
012304  060202                         ADD     R2,R2
012306  060702                         ADD     PC,R2           ;JUMP TO DO THE APPROPRIATE OPERATION,
012310  061207                         ADD     (R2),PC         ;LEFT OPERAND IS 0(SP),2(SP),
012312  001162         TABLE2: .WORD    UPARRO-TABLE2   ;RIGHT OPERAND IS FAC1(R5),FAC2(R5),
012314  000124                 .WORD    STAR-TABLE2
012316  000154                 .WORD    SLASH-TABLE2
012320  000116                 .WORD    PLUS-TABLE2
012322  000056                 .WORD    UNARY-TABLE2
012324  000052                 .WORD    MINUS-TABLE2
012326  000042                 .WORD    TERMIN-TABLE2
012330  016546  000042         NOTNOW: MOV     FAC2(R5),-(SP)  ;(E,G,  A+B+ ) DONT DO THE + YET,
012334  020604                         CMP     SP,R4
012336  103410                         BLO     ERRPDL
012340  016546  000040                 MOV     FAC1(R5),-(SP)
012344  010346                         MOV     R3,-(SP)
012346  005201                         INC     R1
012350  000167  177050                 JMP     OPERAND
012354  000241         TERMIN: CLC                     ;CARRY OFF MEANS NUMERIC RESULT,
012356  000207                         RTS     PC
012360  000167  177406         ERRPDL: JMP     ERRPDL
012364  004767  007060         MINUS:  JSR     PC,SUBSTK
012370  005765  000040         UNARY:  TST     FAC1(R5)
012374  001404                         BEQ     UINTEG
012376  062765  100000  000040         ADD     #100000,FAC1(R5)
012404  000670                         BR      OPRATOR
012406  005465  000042         UINTEG: NEG     FAC2(R5)
012412  102265                         BVC     OPRATOR
012414  012765  044000  000040         MOV     #44000,FAC1(R5)
012422  005065  000042                 CLR     FAC2(R5)
012426  000657                         BR      OPRATOR
012430  004767  175166         PLUS:   JSR     PC,ADDSTK
012434  000654                         BR      OPRATOR
012436  012767  013214  000000G STAR:  MOV     #ERSTAR,SERVEC
012444  004467  002444                 JSR     R4,FPPSAV
012450  012514                         .WORD   TSTSTK          ;TEST TOP OF STACK AND FLOAT IF INT
012452  012530                         .WORD   PUSHF           ;PUSH FAC AND FLOAT IF NEG
012454  000000G                        .WORD   $MLR            ;PERFORM MULT
012456  016068                         .WORD   POP             ;POP RESULT
012460  015066                         .WORD   FPPRES
012462  000167  177300         STAR1:  JMP     OPRATOR
012466  012767  013576  000000G SLASH:  MOV     #ERRDIV,SERVEC
012474  004467  002414                 JSR     R4,FPPSAV
012500  012514                         .WORD   TSTSTK
012502  012530                         .WORD   PUSHF
012504  000000G                        .WORD   $DVR
012506  016068                         .WORD   POP
012510  015066                         .WORD   FPPRES
012512  000763                         BR      STAR1
012514  005716         TSTSTK: TST     (SP)
012516  001003                         BNE     TSTS2
012520  005726         TSTS1:  TST     (SP)+
012522  000167  000000G                JMP     $IR
012526  000134         TSTS2:  JMP     @(R4)+          ;RETURN
012530  016546  000042         PUSHF:  MOV     FAC2(R5),-(SP)
```

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2994  012534  016546  000040            MOV     FAC1(R5),-(SP)
2995  012540  001767                    BEQ     TSTS1           ;FLOAT IF INTEGER
2996  012542  000134                    JMP     @(R4)+          ;RETURN
2997                                    .IFDF   $NOSTR
2998                              ;DUMMY ENTRY POINTS FOR $NOSTR
2999                              SAVCHAR:
3000                              ARGB:
3001                              MAKEST:
3002                              SOPRAT:
3003                              STOSVAR:
3004                              ERRMIX:
3005                              STPRO:
3006                                    .ENDC
3007
3008                              ERRSYN:
3009  012544  000004            ERRSX5: IOT
3010                                    .IFNDF  $LONGER
3011  012546  054523     116            .ASCII  'SYN'
3012                                    .ENDC
3013                                    .IFDF   $LONGER
3014                                    .ASCII  'SYNTAX ERROR'
3015
3016                                    .ENDC
3017  012551     000                    .BYTE 0
3018                                    .EVEN
3019
3020                                    .IFNDF  $NOSTR
3021  012552  122127  000377    QUOTE:  CMPB    (R1)+,#',TEXT
3022  012556  001372                    BNE     ERRSX5
3023  012560  010203                    MOV     R2,R3           ;SAVE QUOTE CHAR,
3024  012562  010102                    MOV     R1,R2
3025  012564  105721                    TSTB    (R1)+
3026  012566  001376                    BNE     .-2
3027  012570  020604                    CMP     SP,R4
3028  012572  103672                    BLO     ERRPD5
3029  012574  010246                    MOV     R2,-(SP)
3030  012576  162716  000003            SUB     #3,(SP)
3031  012602  010146                    MOV     R1,-(SP)
3032  012604  160216                    SUB     R2,(SP)
3033  012606  122103                    CMPB    (R1)+,R3                ;SAME AS STARTING QUOTE CHAR,?
3034  012610  001359                    BNE     ERRSX5
3035  012612  005316                    DEC     (SP)
3036  012614  001410                    BEQ     QUNULL
3037  012616  010602                    MOV     SP,R2
3038  012620  062702  000002            ADD     #2,R2
3039  012624  004767  004422            JSR     PC,MAKESTR
3040  012630  012616                    MOV     (SP)+,(SP)
3041  012632  000167  000324            JMP     QUOTBUM
3042  012636  022626            QUNULL: CMP     (SP)+,(SP)+
3043  012640  012746  177777    GOTVAL: MOV     #-1,-(SP)
3044  012644  000425                    BR      SOPRATR
3045                                    .ENDC
3046
3047  012646  000167  000330    ERRPD2: JMP     ERRPD2
3048
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3049
3050  012652  004767  003532            .IFNDF  $NOSTM
3051  012656  000406    STRGARR:JSR     PC,LOCGET
3052  012660  005722                    BR      STRGBTH
3053  012662  026227  000002  177777    TST     (R2)+
3054  012670  001421    STRGVAR:CMP     2(R2),#-1
3055  012672  011202                    BEQ     STRGBTH
3056  012674  011203                    MOV     (R2),R2
3057  012676  020327  177777    STRGBTH:MOV     (R2),R3
3058  012702  001756                    CMP     R3,#-1
3059  012704  020604                    BEQ     GOTVAL
3060  012706  103757                    CMP     SP,R4
3061  012710  005046                    BLO     ERRPD2
3062  012712  111316                    CLR     -(SP)
3063  012714  004767  004332            MOVB    (R3),(SP)
3064  012720  126627  000002  000226    JSR     PC,MAKESTR
3065  012726  001434    SOPRATR:CMPB    2(SP),#',AMPERS
3066  012730  121127  000226                    BEQ     CONCAT
3067  012734  001422                    CMPB    (R1),#',AMPERS
3068  012736  126627  000002  000235            BEQ     AMPWAIT
3069  012744  001277                    CMPB    2(SP),#',TERM
3070  012746  012600                    BNE     ERRSX5
3071  012750  005726                    MOV     (SP)+,R0
3072  012752  011602                    TST     (SP)+
3073  012754  010016                    MOV     (SP),R2
3074  012756  005200                    MOV     R0,(SP)
3075  012760  001406                    INC     R0
3076  012762  062700  000002            BEQ     SOPRX           ;CHECK NULL STRING
3077  012766  010603                    ADD     #2,R0
3078  012770  110340                    MOV     SP,R3
3079  012772  000303                    MOVB    R3,-(R0)
3080  012774  110340                    SWAB    R3
3081  012776  000261                    MOVB    R3,-(R0)
3082  013000  000112    SOPRX:  SEC
3083  013002  112146                    JMP     (R2)
3084  013004  004767  176372    AMPWAIT:MOVB    (R1)+,-(SP)
3085  013010  103743                    JSR     PC,EVAL
3086  013012  000004                    BCS     SOPRATR
3087                              ERRMIX: IOT
3088  013014  051516     115            .IFNDF  $LONGER
3089                                    .ASCII  \NSM\
3090                                    .ENDC
3091                                    .IFDF   $LONGER
3092                                    .ASCII  'NUMBERS AND STRINGS MIXED'
3093  013017     000                    .ENDC
3094                                    .BYTE 0
3095  013020  021627  177777            .EVEN
3096  013024  001002    CONCAT: CMP     (SP),#-1
3097  013026  022626                    BNE     CATNOT
3098  013030  000733                    CMP     (SP)+,(SP)+
3099  013032  016602  000004            BR      SOPRATR
3100  013036  020227  177777    CATNOT: MOV     4(SP),R2
3101  013042  001004                    CMP     R2,#-1
3102  013044  012600                    BNE     CATLONG
3103  013046  005726                    MOV     (SP)+,R0
                                        TST     (SP)+
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3104  013050  010016                          MOV     R0,(SP)
3105  013052  000444                          BR      CATCOM
3106  013054  005000              CATLONG:CLR     R0
3107  013056  151200                          BISB    (R2),R0
3108  013060  011603                          MOV     (SP),R3
3109  013062  020604                          CMP     SP,R4
3110  013064  103670                          BLO     ERRD02
3111  013066  005046                          CLR     -(SP)
3112  013070  111316                          MOVB    (R3),(SP)
3113  013072  060016                          ADD     R0,(SP)
3114  013074  021627  000377                  CMP     (SP),#377
3115  013100  101042                          BHI     ERRSTR
3116  013102  010602                          MOV     SP,R2
3117  013104  062702  000006                  ADD     #6,R2
3118  013110  004767  004136                  JSR     PC,MAKESTR
3119  013114  012603                          MOV     (SP)+,R3
3120  013116  016602  000004                  MOV     4(SP),R2
3121  013122  005000                          CLR     R0
3122  013124  151200                          BISB    (R2),R0
3123  013126  010366  000004                  MOV     R3,4(SP)
3124  013132  060003                          ADD     R0,R3
3125  013134  062703  000003                  ADD     #3,R3
3126  013140  012602                          MOV     (SP)+,R2
3127  013142  005726                          TST     (SP)+
3128  013144  005000                          CLR     R0
3129  013146  151200                          BISB    (R2),R0
3130  013150  062702  000003                  ADD     #3,R2
3131  013154  112223                          MOVB    (R2)+,(R3)+
3132  013156  005300                          DEC     R0
3133  013160  003375                          BGT     .-4
3134                              STPRO:
3135  013162  011600              QUOTBUM:MOV     (SP),R0
3136  013164  010602              CATCOM: MOV     SP,R2
3137  013166  062700  000003                  ADD     #3,R0
3138  013172  110240                          MOVB    R2,-(R0)
3139  013174  000302                          SWAB    R2
3140  013176  110240                          MOVB    R2,-(R0)
3141  013200  000647                          BR      SOPRATR
3142                                          .ENDC
3143
3144  013202  000167  176564      ERRPD2: JMP     ERRPDL
3145
3146                                          .IFNDF  $NOSTR
3147  013206  000004              ERRSTR: IOT
3148                                          .IFNDF  $LONGER
3149  013210  052123     114                  .ASCII  \$TL\
3150                                          .ENDC
3151                                          .IFDF   $LONGER
3152                                          .ASCII  /STRING TOO LONG/
3153                                          .ENDC
3154  013213     000                          .BYTE 0                                    238
3155                                          .EVEN
3156                                          .ENDC
3157
3158                              EREXP:
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```
3159                              ERSTAR:
3160                              ERADD:
3161  013214  000004              ERROVR: IOT
3162                                          .IFNDF  $LONGER
3163  013216  053117     106                  .ASCII  'OVF'
3164                                          .ENDC
3165                                          .IFDF   $LONGER
3166                                          .ASCII  'OVERFLOW'
3167                                          .ENDC
3168  013221     000                          .BYTE 0
3169                                          .EVEN
3170
3171  013222  012746  000000G       SINFN:  MOV     #SIN,-(SP)
3172  013226  000434                          BR      FUNCT
3173  013230  012746  000000G       COSFN:  MOV     #COS,-(SP)
3174  013234  000431                          BR      FUNCT
3175  013236  012746  000000G       SQRFN:  MOV     #SQRT,-(SP)
3176  013242  012767  010312  000000G       MOV     #ERSQR,SERVEC
3177  013250  000423                          BR      FUNCT
3178  013252  012746  000000G       ATNFN:  MOV     #ATAN,-(SP)
3179  013256  000420                          BR      FUNCT
3180  013260  012746  000000G       EXPFN:  MOV     #EXP,-(SP)
3181  013264  012767  013214  000000G       MOV     #EREXP,SERVEC
3182  013272  000412                          BR      FUNCT
3183  013274  012746  000000G       LOGFN:  MOV     #ALOG,-(SP)
3184  013300  012767  010312  000000G       MOV     #ERLOG,SERVEC
3185  013306  000404                          BR      FUNCT
3186
3187                                          .IFNDF  $NOSTR
3188  013310  000167  177476      ERRMX9: JMP     ERRMIX
3189                                          .ENDC
3190
3191  013314  000167  177662      ERRD11: JMP     ERRDOZ
3192  013320  004767  176856      FUNCT:  JSR     PC,EVAL
3193
3194                                          .IFNDF  $NOSTR
3195  013324  103002                          BCC     FUNCTJ
3196  013326  000167  174700                  JMP     ERRARG
3197                              FUNCTJ:
3198                                          .ENDC
3199
3200  013332  012603                          MOV     (SP)+,R3
3201  013334  001002                          BNE     .+6
3202  013336  000167  001156                  JMP     ERRUFN
3203  013342  122127  000237                  CMPB    (R1)+,#,RPAR
3204  013346  001050                          BNE     ERRSXY
3205  013350  004467  001540                  JSR     R4,FPPSAV
3206  013354  012538                          .WORD   PUSHF           ;PUSH FAC, FLOAT IF NECESSARY
3207  013356  013364                          .WORD   FUNOK           ;GO DO FUNCTION
3208  013360  015066                          .WORD   FPPRES
3209  013362  000440                          BR      OPRFN
3210  013364  010601              FUNOK:  MOV     SP,R1           ;SAVE ADDRESS OF PUSHED ARG
3211  013366  010446                          MOV     R4,-(SP)        ;SAVE R4                   239
3212  013370  012746  013416                  MOV     #FUNRET,-(SP)   ;DUMMY RETURN ADDRESS
3213  013374  012746  000137                  MOV     #137,-(SP)      ;DUMMY JUMP INSTR,
```

```
3214  013400  010146                        MOV     R1,-(SP)        ;ADDR OF ARGUMENT
3215  013402  012746  000401                MOV     #401,-(SP)      ;DUMMY BR
3216  013406  010500                        MOV     R5,R0           ;SAVE R5 VALUE
3217  013410  010605                        MOV     SP,R5           ;RETURN ADDRESS (TO DUMMY PROG IN STK)
3218  013412  004070  000052                JSR     R0,@R3SAVE(R0)
3219  013416  062706  000010        FUNRET: ADD     #8.,SP          ;POP DUMMY PROGRAM
3220  013422  012604                        MOV     (SP)+,R4        ;RESTORE R4
3221  013424  022626                        CMP     (SP)+,(SP)+     ;REMOVE OLD FAC FROM STACK
3222  013426  010065  000040                MOV     R0,FAC1(R5)     ;STORE RESULT IN FAC
3223  013432  010165  000042                MOV     R1,FAC2(R5)
3224  013436  000134                        JMP     @(R4)+          ;AND RETURN
3225
3226                                        .IFNDF  $NOSTR
3227  013440  000167  177346        ERRMX8: JMP     ERRMIX
3228                                        .ENDC
3229
3230  013444  004767  175732        INTFN:  JSR     PC,EVAL
3231
3232                                        .IFNDF  $NOSTR
3233  013450  103773                        BCS     ERRMX8
3234                                        .ENDC
3235
3236  013452  122127  000237                CMPB    (R1)+,#,RPAR
3237  013456  001004                        BNE     ERRSX9
3238  013460  004767  002110                JSR     PC,INT
3239  013464  000167  176476        OPRFN:  JMP     OPRATOR
3240  013470  000167  177050        ERRSX9: JMP     ERRSX5
3241
3242
3243
3244                                ;       IF A IS NOT 0,FLOAT IT
3245  013474  005716                UPARRO: TST     (SP)            ;IS UPPER A 0
3246  013476  001010                        BNE     UA1
3247  013500  005766  000002                TST     2(SP)           ;IS LOWER A 0
3248  013504  001405                        BEQ     UA1
3249  013506  005726                        TST     (SP)+
3250  013510  004467  001400                JSR     R4,FPPSAV
3251  013514  000000G                       .WORD   $IR
3252  013516  015066                        .WORD   FPPRES
3253
3254  013520  012767  014064  000000G UA1:  MOV     #ERREXP,SERVEC
3255  013526  005765  000040                TST     FAC1(R5)        ;IS UPPER B = 0
3256  013532  001036                        BNE     UA10
3257  013534  005765  000042                TST     FAC2(R5)        ;IS LOWER B = 0
3258  013540  001006                        BNE     UA5
3259  013542  012765  000001  000042        MOV     #1,FAC2(R5)     ;SET RESULT 1
3260  013550  022626                UA4:    CMP     (SP)+,(SP)+
3261  013552  000167  176410                JMP     OPRATOR
3262                                ; B IS INTEGER
3263  013556  005716                UA5:    TST     (SP)            ;IS A = 0
3264  013560  001077                        BNE     UA17
3265  013562  005765  000042                TST     FAC2(R5)        ;IS LOWER B > 0
3266  013566  100013                        BPL     UA9             ;NO, ERROR MESSAGE
3267  013570  000004                UA8:    IOT
3268                                        .IFNDF  $LONGER
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3269  013572  053104      060               .ASCII  'DV0'
3270                                        .ENDC
3271                                        .IFDF   $LONGER
3272                                        .ASCII  'DIVISION BY 0'
3273                                        .ENDC
3274  013575      000                       .BYTE   0
3275                                        .EVEN
3276  013576  020027  004000        ERRDIV: CMP     R0,#4000
3277  013602  103372                        BHIS    UA8
3278  013604  000167  177404                JMP     ERSTAK
3279  013610  103367                        BHIS    UA8             ;DIV BY 0
3280  013612  000167  177376                JMP     ERROVR          ;OVERFLOW
3281  013616  005065  000040        UA9:    CLR     FAC1(R5)        ;SET RESULT 0
3282  013622  005065  000042                CLR     FAC2(R5)
3283  013626  000750                        BR      UA4
3284
3285                                ;FIX B IF INTEGER < 256
3286  013630  005765  000042        UA10:   TST     FAC2(R5)
3287  013634  001036                        BNE     UA10,5
3288  013636  016500  000040                MOV     FAC1(R5),R0
3289  013642  010002                        MOV     R0,R2
3290  013644  042700  100177                BIC     #100177,R0      ;EXTRACT EXPONENT
3291  013650  020027  040200                CMP     R0,#40200       ;CHECK TOO SMALL
3292  013654  103426                        BLO     UA10,5
3293  013656  042702  177600                BIC     #177600,R2
3294  013662  052702  000200                BIS     #200,R2         ;R2 IS MANTISSA
3295  013666  020027  042000        UA10A:  CMP     R0,#42000
3296  013672  001406                        BEQ     UA10B
3297  013674  101016                        BHI     UA10,5
3298  013676  006202                        ASR     R2
3299  013700  103414                        BCS     UA10,5          ;IF BIT CLEARED,NO GOOD
3300  013702  062700  000200                ADD     #200,R0         ;UPDATE EXPONENT
3301  013706  000767                        BR      UA10A
3302  013710  005765  000040        UA10B:  TST     FAC1(R5)
3303  013714  100001                        BPL     UA10C
3304  013716  005402                        NEG     R2
3305  013720  005065  000040        UA10C:  CLR     FAC1(R5)
3306  013724  010265  000042                MOV     R2,FAC2(R5)
3307  013730  000712                        BR      UA5
3308                                ;B IS REAL
3309  013732  005716                UA10,5: TST     (SP)            ;IS A = 0
3310  013734  001405                        BEQ     UA12
3311  013736  004467  001152                JSR     R4,FPPSAV
3312  013742  016046                        .WORD   PUSH
3313  013744  014104  014146                .WORD   UAJMP,UA23
3314
3315  013750  005765  000040        UA12:   TST     FAC1(R5)        ;IS UPPER B> 0
3316  013754  100320                        BPL     UA9             ;YES
3317  013756  000704                        BR      UA8             ;NO, ERROR
3318
3319                                ;B INTEGER, A REAL
3320  013760  016500  000042        UA17:   MOV     FAC2(R5),R0
3321  013764  010002                        MOV     R0,R2           ;SAVE FOR SIGN TEST
3322  013766  002001                        BGE     UA17A
3323  013770  005400                        NEG     R0
```

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3324  013772  020027  000256          UA17A:  CMP     R0,#256         ;R0 IS ABS(B) IF TOO BIG, FLOAT
3325  013776  103057                          BHIS    UA20
3326  014000  004467  001110                  JSR     R4,FPPSAV       ;GO INTO POLISH MODE
3327  014004  016060                          ,WORD   POP             ;CURRENT PRODUCT IS A
3328  014006  016072                          ,WORD   PUSH1           ;CURRENT ANSWER IS 1 (ON STK)
3329  014010  014072  014020          UA17B:  ,WORD   UAASR,UA17D     ;SHIFT B, BRANCH IF BIT IS 0
3330  014014  016046                          ,WORD   PUSH            ;GET CURRENT PRODUCT ONT OSTACK
3331  014016  000000G                         ,WORD   $MLR            ;MULTIPLY INTO CURRENT ANSWER
3332  014020  014110  014040          UA17D:  ,WORD   UATST0,UA17F    ;TEST IF DONE, BRANCH IF SO
3333  014024  016046  016046                  ,WORD   PUSH,PUSH       ;TWO COPIES OF CURRENT PRODUCT
3334  014030  000000G                         ,WORD   $MLR            ;SQUARE IT
3335  014032  016060                          ,WORD   POP             ;AND PUT RESULT BACK
3336  014034  014104  014010                  ,WORD   UAJMP,UA17B     ;POLISH JUMP TO 17B
3337  014040  016060                  UA17F:  ,WORD   POP             ;STORE ANSWER INTO FAC
3338  014042  014120  014056                  ,WORD   UATST2,UA19     ;TEST SIGN B, IF + JUMP
3339  014046  016072                          ,WORD   PUSH1           ;PUSH 1 ONTO STACK
3340  014050  016046                          ,WORD   PUSH
3341  014052  000000G                         ,WORD   $OVR            ;ANS = 1/ANS IF B NEG
3342  014054  016060                          ,WORD   POP     ;POP ANSWER TO FAC
3343  014056  015066                  UA19:   ,WORD   FPPRES
3344  014060  000167  176102                  JMP     OPRATOR         ;AND GET OUT
3345
3346                                  ERREXP:
3347  014064  000004                  UA21:   IOT
3348                                          ,IFNDF  $LONGER
3349  014066  042536     122                  ,ASCII  \?ER\
3350                                          ,ENDC
3351                                          ,IFDF   $LONGER
3352                                          ,ASCII  /? ERROR/
3353                                          ,ENDC
3354  014071     000                          ,BYTE   0
3355                                          ,EVEN
3356
3357  014072  006265  000044          UAASR:  ASR     R0SAVE(R5)
3358  014076  103002                          BCC     UAJMP
3359  014100  005724                  UANJMP: TST     (R4)+           ;SKIP OVER JUMP ADDRESS
3360  014102  000134                          JMP     @(R4)+
3361  014104  011404                  UAJMP:  MOV     @R4,R4          ;POLISH MODE JUMP
3362  014106  000134                          JMP     @(R4)+
3363  014110  005765  000044          UATST0: TST     R0SAVE  (R5)
3364  014114  001773                          BEQ     UAJMP
3365  014116  000770                          BR      UANJMP
3366  014120  005765  000050          UATST2: TST     R2SAVE(R5)      ;TEST SIGN OF B
3367  014124  100367                          BPL     UAJMP           ;POLISH JUMP IF B +
3368  014126  000764                          BR      UANJMP
3369  014130  005716                  UATSTA: TST     @SP
3370  014132  100734                          BMI     UA21
3371  014134  000134                          JMP     @(R4)+
3372
3373  014136  010246                  UA20:   MOV     R2,-(SP)        ;PUSH INT B ON STACK
3374  014140  004467  000750                  JSR     R4,FPPSAV
3375  014144  000000G                         ,WORD   $IR             ;FLOAT B
3376                                  UA23:
3377  014146  014170                          ,WORD   REVRSE          ;REVERSE TOP TWO ON STK
3378  014150  014130                          ,WORD   UATSTA          ;TEST TOP STK, BR TO ERR IF -
```

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3379  014152  014212                          ,WORD   CALOG           ;CALL ALOG FUNCTION ON A, RESULT TO FAC
3380  014154  016046                          ,WORD   PUSH            ;PUSH LOG(A) ONTO STACK
3381  014156  000000G                         ,WORD   $MLR            ;CALC B*LOG(A)
3382  014160  014224                          ,WORD   CEXP            ;CALC EXP(B*LOG(A)), RESULT TO FAC
3383  014162  015066                          ,WORD   FPPRES
3384  014164  000167  175776                  JMP     OPRATOR
3385  014170  012600                  REVRSE: MOV     (SP)+,R0        ;ROUTINE TO REVERSE TOP 2
3386  014172  012601                          MOV     (SP)+,R1        ;FLTPT NUMBERS ON STACK
3387  014174  012602                          MOV     (SP)+,R2
3388  014176  012603                          MOV     (SP)+,R3
3389  014200  010146                          MOV     R1,-(SP)
3390  014202  010046                          MOV     R0,-(SP)
3391  014204  010346                          MOV     R3,-(SP)
3392  014206  010246                          MOV     R2,-(SP)
3393  014210  000134                          JMP     @(R4)+
3394  014212  012765  000000G 000052  CALOG: MOV     #ALOG,R3SAVE(R5)
3395  014220  000167  177140                  JMP     FUNOK
3396  014224  012765  000000G 000052  CEXP:  MOV     #EXP,R3SAVE(R5)
3397  014232  000167  177126                  JMP     FUNOK
3398  014236  000167  175530          ERRPD4: JMP     ERRPDL
3399
3400                                          ,IFNDF  $NOSTR
3401  014242  000167  176544          ERRMX1: JMP     ERRM1X
3402                                          ,ENDC
3403
3404  014246  000167  176272          ERRSXA: JMP     ERRSX5
3405  014252  112102                  FNFN:   MOVB    (R1)+,R2
3406  014254  122127  000255                  CMPB    (R1)+,#,LPAR
3407  014260  001372                          BNE     ERRSXA
3408  014262  066502  000004                  ADD     PDL(R5),R2
3409  014266  220604                          CMP     SP,R4
3410  014270  103762                          BLO     ERRPD4
3411  014272  011200                          MOV     (R2),R0         ;R0 NOW CONTAINS THE DEF POINTER,
3412  014274  001511                          BEQ     ERRUFN
3413  014276  010046                  FNSWAP: MOV     R0,-(SP)
3414  014300  004767  175076                  JSR     PC,EVAL
3415
3416                                          ,IFNDF  $NOSTR
3417  014304  103426                          BCS     FNSTR
3418                                          ,ENDC
3419
3420  014306  012600                          MOV     (SP)+,R0                ;RESTORE THE DEF POINTER,
3421  014310  112002                          MOVB    (R0)+,R2                ;GET THE VARIABLE FROM THE DEF,
3422  014312  100500                          BMI     ERRAG1
3423  014314  000302                          SWAB    R2
3424  014316  152002                          BISB    (R0)+,R2
3425  014320  061502                          ADD     (R5),R2
3426
3427                                          ,IFNDF  $NOSTR
3428  014322  021227  177777                  CMP     (R2),#,SVAR     ;IF THE DEF VARIABLE IS STRING AND
3429  014326  001745                          BEQ     ERRMX1          ;THE VALUE ISNT THEN ITS AN ERROR,
3430                                          ,ENDC
3431
3432  014330  022227  177775                  CMP     (R2)+,#,SCALAR
3433  014334  001401                          BEQ     .+4
```

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3434  014336  011202                        MOV     (R2),R2
3435  014340  020604                        CMP     SP,R4
3436  014342  103735                        BLO     ERRPD4
3437  014344  011246                        MOV     (R2),-(SP)      ;STACK THE OLD VALUE AND REPLACE IT
3438  014346  016522  000040                MOV     FAC1(R5),(R2)+  ;WITH THE NEW VALUE
3439  014352  011246                        MOV     (R2),-(SP)
3440  014354  016512  000042                MOV     FAC2(R5),(R2)
3441  014360  000458                        BR      FNREPL
3442
3443                                        ;IFNDF  $NOSTR
3444  014362  016600  000002        FNSTR:  MOV     2(SP),R0                ;RESTORE THE DEF POINTER,
3445  014366  112002                        MOVB    (R0)+,R2                ;GET THE VARIABLE FROM THE DEF,
3446  014370  100451                        BMI     ERRAG1
3447  014372  000302                        SWAB    R2
3448  014374  152002                        BISB    (R0)+,R2
3449  014376  061502                        ADD     (R5),R2
3450  014400  022227  177777                CMP     (R2)+,#,SVAR    ;IF THE DEF VARIABLE IS NUMERIC AND
3451  014404  001316                        BNE     ERRMX1          ;THE VALUE ISNT THEN ITS AN ERROR,
3452  014406  026227  000002  177777        CMP     2(R2),#-1       ;IF THE VAR ISNT A STRING SCALAR
3453  014414  001401                        BEQ     .+4
3454  014416  011202                        MOV     (R2),R2         ;THEN DO THIS,
3455  014420  011203                        MOV     (R2),R3         ;R3 NOW CONTAINS THE OLD VALUE;
3456  014422  012612                        MOV     (SP)+,(R2)      ;@(R2) NOW CONTAINS THE NEW VALUE,
3457  014424  010316                        MOV     R3,(SP)         ;@(SP) NOW CONTAINS THE OLD VALUE,
3458  014426  010246                        MOV     R2,-(SP)                ;TOP(STK) IS A TEMP FOR VAR ADDRESS,
3459  014430  011202                        MOV     (R2),R2         ;R2 NOW CONTAINS THE NEW VALUE;
3460  014432  005202                        INC     R2
3461  014434  001412                        BEQ     FNNEWNL         ;BRANCH IF THE NEW VALUE IS NULL,
3462  014436  005203                        INC     R3
3463  014440  001004                        BNE     FNOLNN          ;BRANCH IF THE OLD VALUE IS NONNULL,
3464  014442  116622  000001                MOVB    1(SP),(R2)+     ;OLD VALUE IS NULL, NEW IS NOT; SO:
3465  014446  112612                        MOVB    (SP)+,(R2)      ;MAKE AN ABS BACKPTR TO THE VAR,
3466  014450  000414                        BR      FNREPL          ;(THE NEW VALUE IS NOW PROTECTED)
3467  014452  112322        FNOLNN: MOVB    (R3)+,(R2)+     ;OLD AND NEW ARE BOTH NONNULL SO:
3468  014454  111312                        MOVB    (R3),(R2)       ;PUT OLD BACKPTR INTO THE NEW VALUE,
3469  014456  162703  000002                SUB     #2,R3
3470  014462  005726        FNNEWNL:TST     (SP)+           ;GET RID OF THE TEMP,
3471  014464  010602                        MOV     SP,R2
3472  014466  005203                        INC     R3
3473  014470  001404                        BEQ     FNREPL          ;    (CHECK NULL STRING!)
3474  014472  000302                        SWAB    R2              ;SET THE BACKPTR OF THE OLD VALUE
3475  014474  110223                        MOVB    R2,(R3)+        ;TO ITS CURRENT STACK ADDRESS,
3476  014476  000302                        SWAB    R2
3477  014500  110213                        MOVB    R2,(R3)
3478                                        .ENDC
3479
3480  014502  121027  000243        FNREPL: CMPB    (R0),#,COMMA
3481  014506  001007                        BNE     FNNOCOM
3482  014510  122021                        CMPB    (R0)+,(R1)+
3483  014512  001671                        BEQ     FNSWAP
3484  014514  000167  173572        ERRAG1: JMP     ERRARG
3485  014520  000004                ERRUFN: IOT
3486                                        .IFNDF  $LONGER
3487  014522  043125     116                .ASCII  'UFN'
3488                                        .ENDC
```

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3489                                        .IFDF   $LONGER
3490                                        .ASCII  'UNDEFINED FUNCTION'
3491                                        .ENDC
3492  014525     000                        .BYTE 0
3493                                        .EVEN
3494  014526  121027  000237        FNNOCOM:CMPB    (R0),#,RPAR
3495  014532  001370                        BNE     ERRAG1
3496  014534  010046                        MOV     R0,-(SP)
3497  014536  122021                        CMPB    (R0)+,(R1)+
3498  014540  001365                        BNE     ERRAG1
3499  014542  122027  000254                CMPB    (R0)+,#,EQ
3500  014546  001362                        BNE     ERRAG1
3501  014550  010146                        MOV     R1,-(SP)
3502  014552  010001                        MOV     R0,R1
3503  014554  004767  174622                JSR     PC,EVAL
3504  014560  103402                        BCS     .+6
3505  014562  005003                        CLR     R3
3506  014564  000401                        BR      .+4
3507  014566  012603                        MOV     (SP)+,R3
3508  014570  121127  000201                CMPB    (R1),#,EOL
3509  014574  001224                        BNE     ERRSXA
3510  014576  012601                        MOV     (SP)+,R1
3511  014600  012600                        MOV     (SP)+,R0
3512  014602  114046        FNRLUP: MOVB    -(R0),-(SP)
3513  014604  114066  000001                MOVB    -(R0),1(SP)
3514  014610  012602                        MOV     (SP)+,R2
3515  014612  061502                        ADD     (R5),R2
3516
3517                                        .IFNDF  $NOSTR
3518  014614  021227  177777                CMP     (R2),#,SVAR
3519  014620  001416                        BEQ     FNRSTR
3520                                        .ENDC
3521
3522  014622  022227  177775                CMP     (R2)+,#,SCALAR
3523  014626  001401                        BEQ     .+4
3524  014630  011202                        MOV     (R2),R2
3525  014632  012662  000002                MOV     (SP)+,2(R2)
3526  014636  012612                        MOV     (SP)+,(R2)
3527  014640  000426                        BR      FNCHK
3528  014642  012612        FNRSSC: MOV     (SP)+,(R2)
3529  014644  010046                        MOV     R0,-(SP)
3530  014646  011200                        MOV     (R2),R0
3531  014650  161502                        SUB     (R5),R2
3532  014652  005202                        INC     R2
3533
3534                                        .IFNDF  $NOSTR
3535  014654  000411                        BR      FNRCOM
3536  014656  005722        FNRSTR: TST     (R2)+
3537  014660  026227  000002  177777        CMP     2(R2),#-1
3538  014666  001765                        BEQ     FNRSSC
3539  014670  011202                        MOV     (R2),R2
3540  014672  012612                        MOV     (SP)+,(R2)
3541  014674  010046                        MOV     R0,-(SP)
3542  014676  011200                        MOV     (R2),R0
3543                                        .ENDC
```

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3544
3545  014700  005200                FNRCOM: INC     R0
3546  014702  001404                        BEQ     FNRSNUL
3547  014704  000302                        SWAB    R2
3548  014706  110220                        MOVB    R2,(R0)+
3549  014710  000302                        SWAB    R2
3550  014712  110220                        MOVB    R2,(R0)+
3551  014714  012600                FNRSNUL:MOV     (SP)+,R0
3552  014716  124027  000255        FNCHK:  CMPB    -(R0),#,LPAR
3553  014722  001327                        BNE     FNRLUP
3554
3555                                        ;IFNDF  $NOSTM
3556  014724  005703                        TST     R3
3557  014726  001410                        BEQ     FNNUMER
3558  014730  010346                        MOV     R3,-(SP)
3559  014732  020327  177777                CMP     R3,#177777      ;CHECK NULL STRING
3560  014736  001002                        BNE     .+6
3561  014740  000167  175754                JMP     $OPRATR
3562  014744  000167  176212                JMP     $TPRO
3563                                        ;ENDC
3564
3565  014750  000167  175212        FNNUMER:JMP     OPRATOR
3566                                        ;EOT
3567
```

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```
3568                                ;                               SOURCE FILE #6
3569                                ;-------------------------------------------------------
3570                                ;  SUBROUTINE (FIXUP)   CALLED BY JSR PC
3571                                ;                      MATCHES TYPES OF 0(SP),2(SP) AND FAC1(R5),FAC2(R5)
3572                                ;                      R0,R1  UNUSED
3573                                ;                      R2  DESTROYED
3574                                ;                      R3,R4  UNUSED
3575                                ;                      R5  MUST POINT TO USER AREA
3576                                ;                      SP  GOES NO DEEPER AFTER JSR
3577  014754  012602                FIXUP:  MOV     (SP)+,R2
3578  014756  005716                        TST     (SP)
3579  014760  001413                        BEQ     FIXTST
3580  014762  005765  000040                TST     FAC1(R5)
3581  014766  001021                        BNE     FIXRET          ;COND CODES=NONZERO MEANS FLOATING,
3582  014770  016546  000042                MOV     FAC2(R5),-(SP)          !****
3583  014774  004467  000114                JSR     R4,FPPSAV
3584  015000  000000G                       .WORD   $IR
3585  015002  016060                        .WORD   POP
3586  015004  015066                        .WORD   FPPRES
3587  015006  000410                        BR      FIXCLZ
3588  015010  005765  000040        FIXTST: TST     FAC1(R5)
3589  015014  001406                        BEQ     FIXRET          ;COND CODES=0 MEANS INTEGER,
3590  015016  005726                        TST     (SP)+                   !****
3591  015020  004467  000070                JSR     R4,FPPSAV
3592  015024  000000G                       .WORD   $IR
3593  015026  015066                        .WORD   FPPRES
3594  015030  000244                FIXCLZ: CLZ                     ;COND CODES=NONZERO MEANS FLOATING,
3595  015032  000112                FIXRET: JMP     (R2)
3596
```

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3597                                    ;*****************************************************
3598                                    ;  SUBROUTINE 'FLINE'    CALLED BY JSR PC
3599                                    ;                       FINDS THE ADDRESS OF THE LINE NO
3600                                    ;                       REFERENCED BY (R1) IN R2,
3601                                    ;                       IF THE SYMBOL TABLE REFERENCE IS NOT A LINE NO,
3602                                    ;                       SETS CARRY, OTHERWISE, THE CARRY IS CLEAR,
3603  015034  112102                    FLINE:  MOVB    (R1)+,R2
3604  015036  100407                            BMI     FLE
3605  015040  000302                            SWAB    R2
3606  015042  152102                            BISB    (R1)+,R2
3607  015044  061502                            ADD     (R5),R2
3608  015046  012200                            MOV     (R2)+,R0
3609  015050  020027  177775                    CMP     R0,#,$CALAR
3610  015054  103402                            BLO     FLX
3611  015056  000261                    FLE:    SEC
3612  015060  000207                            RTS     PC
3613  015062  000241                    FLX:    CLC
3614  015064  000207                            RTS     PC
3615
```



```
3616                                    ;*****************************************************
3617                                    ;  ROUTINE 'FPPRES'      CALLED IN POLISH MODE
3618                                    ;                       RESTORES R0 THRU R4 SAVED BY FPPSAV
3619                                    ;                       AND RETURNS IN NORMAL EXEC MODE
3620  015066  016500  000044            FPPRES: MOV     R0SAVE(R5),R0
3621  015072  016501  000046                    MOV     R1SAVE(R5),R1
3622  015076  016502  000050                    MOV     R2SAVE(R5),R2
3623  015102  016503  000052                    MOV     R3SAVE(R5),R3
3624  015106  016546  000054                    MOV     R4SAVE(R5),-(SP)
3625  015112  000204                            RTS     R4
3626
3627
3628                                    ;*****************************************************
3629                                    ;  ROUTINE 'FPPSAV'      CALLED BY JSR R4
3630                                    ;                       SAVES R0 THRU R4, AND RETURNS IN
3631                                    ;                       POLISH MODE
3632  015114  010065  000044            FPPSAV: MOV     R0,R0SAVE(R5)
3633  015120  010165  000046                    MOV     R1,R1SAVE(R5)
3634  015124  010265  000050                    MOV     R2,R2SAVE(R5)
3635  015130  010365  000052                    MOV     R3,R3SAVE(R5)
3636  015134  012665  000054                    MOV     (SP)+,R4SAVE(R5)
3637  015140  000134                            JMP     @(R4)+          ;ENTER POLISH MODE
3638
```

```
                                        ;
                                        ; GET1BYT (GET2BYT) - GET BYTE OUT OF RING BUFFER USING
                                        ;  GET POINTER 1 (R2),
                                        ;
                                        ; CALL: #[BUFF, HDR, BASE],R1
                                        ;       #[BASE OFFSET OF GET PTR],R3
                                        ;       JSR     PC,GET1BYT
                                        ;
                                        ;  USES R0,R1,R2,R3
                                        ;
                                        ;  RETURN CHAR, IN R0,
                                        ;  'C' BIT IS: CLR IF 'CHAR' OBTAINED
                                        ;               SET IF 'BUFF' WAS EMPTY (NO 'CHAR')
                                        ;
015142 012703 000004            GET1BYT:MOV     #8GET1,R3
015146 000402                           BR      GETBYT
015150 012703 000006            GET2BYT:MOV     #8GET2,R3
015154 012702 177776            GETBYT: MOV     #PS,R2          ;STATUS
                                        MOV     (R2),-(SP)
015160 011246
015162 012712 000340                    MOV     #PR7,(R2)       ;HIGHEST PRIORITY
015166 060103                           ADD     R1,R3
015170 021361 000010                    CMP     (R3),8PUT(R1)   ;ANYTHING IN BUFF?
015174 001412                           BEQ     BUFEMP
015176 113300                           MOVB    @(R3)+,R0       ;GET BYTE
015200 005243                           INC     -(R3)           ;PT, TO NEXT BYTE
015202 021361 000002                    CMP     (R3),8END(R1)   ;WRAP AROUND?
015206 101402                           BLOS    NOWRP
015210 016113 000000                    MOV     8STRT(R1),(R3)  ;PT, TO NEXT BYTE TO GET
015214 012612                   NOWRP:  MOV     (SP)+,(R2)      ;STATUS BACK
015216 000241                           CLC                     ;SIGNAL SUCCESS
015220 000207                           RTS     PC
015222 012612                   BUFEMP: MOV     (SP)+,(R2)      ;STATUS BACK
015224 000261                           SEC                     ;SHOW FAILURE
015226 000207                           RTS     PC
```

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```
                                        ;-------------------------------------------------------
                                        ;
                                        ; GETCHAR - RETURN A CHAR, IN R0 OR WAIT UNTIL YOU CAN
                                        ;
                                        ; CALL: #[BUFF, HDR, BASE],R1
                                        ;       JSR     PC,GETCHAR
                                        ;
                                        ;  USES R3, (R0,R1,R2)
                                        ;
                                        ;  RETURNS CHAR, IN R0
                                        ;  IF PAPER TAPE READER EOT FOUND, EXIT TO 'READY';
                                        ;
015230 010246                   GETCHAR:MOV     R2,-(SP)
015232 004767 177704            GETCH1: JSR     PC,GET1BYT
015236 103405                           BCS     NOCHAR          ;NOTHING THERE YET
015240 016102 000012                    MOV     BFSPEC(R1),R2   ;CHECK IF READER STOPPED
015244 003011                           BGT     XCHAR           ;0 OR - IS OK, BRANCH IF CHAR
015246 012602                   GETX:   MOV     (SP)+,R2
015250 000207                           RTS     PC
015252 016100 000012            NOCHAR: MOV     BFSPEC(R1),R0   ;CHECK EOF OR EXTRA CHAR
015256 001423                           BEQ     REENAB
015260 005001 000012                    CLR     BFSPEC(R1)
015264 000261                           SEC
015266 000767                           BR      GETX
015270 010046                   XCHAR:  MOV     R0,-(SP)        ;PUSH OLD CHAR
015272 010200                           MOV     R2,R0           ;POSITION NEXT
015274 004767 003314                    JSR     PC,PUTBYT
015300 103001                           BCC     .+4             ;MAKE SURE IT GOT IN!
015302 000000                           HALT
015304 012600                           MOV     (SP)+,R0        ;GET BACK OLD CHAR
015306 005061 000012                    CLR     BFSPEC(R1)
015312 116502 000077                    MOVB    IDEV(R5),R2
015316 012772 000101 015360             MOV     #101,@ITAB(R2)  ;RE-ENABLE INPUT DEVICE
015324 000750                           BR      GETX            ; (CARRY IS CLEAR)
                                        ;       RE-ENABLE FROM A DEAD START
015326 116502 000077            REENAB: MOVB    IDEV(R5),R2
015332 032772 004000 015360             BIT     #4000,@ITAB(R2)         ;CHECK BUSY BIT
015340 001003                           BNE     GCWAIT
015342 012772 000101 015360             MOV     #101,@ITAB(R2)
015350 000001                   GCWAIT: WAIT                    ;WAIT FOR AN INTERRUPT
015352 004767 000524                    JSR     PC,IOWAIT       ;WASTE TIME
015356 000725                           BR      GETCH1

                                        ;       TABLE OF INPUT DEVICE STATUS REGISTERS
015360 177560                   ITAB:   .WORD   TKS
015362 177550                           .WORD   PRS
```

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3721                                    ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3722                                    ; 'GETVAR' SUBROUTINE
3723                                    ;               THIS SUBROUTINE READS A VARIABLE NAME OR
3724                                    ;               AN ARRAY ELEMENT, AND ADDRESSES THAT
3725                                    ;               VARIABLE IN CORE, SO THAT A SUBSEQUENT 'STOVAR'
3726                                    ;               CALL WILL STORE THE FAC IN THE VARIABLE.
3727                                    ;               DESTROYS FAC1 AND FAC2.
3728                                    ;               CALLED BY JSR PC,GETVAR
3729                                    ;                       R1 POINTS TO THE CODE NAMING THE VARIABLE
3730                                    ;
3731  015364  010265  000022           GETVAR: MOV     R2,VARSAV(R5)
3732  015370  012702  177777                   MOV     #-1,R2
3733  015374  010265  000024                   MOV     R2,SS1SAV(R5)
3734  015400  010265  000026                   MOV     R2,SS2SAV(R5)
3735  015404  121127  000295                   CMPB    (R1),#,LPAR
3736  015410  001043                           BNE     NOSUBS
3737  015412  005201                           INC     R1
3738  015414  004767  173702                   JSR     PC,EVAL
3739
3740                                           .IFNDF  $NOSTK
3741  015420  103442                           BCS     ERRMX3
3742                                           .ENDC
3743
3744  015422  004767  000146                   JSR     PC,INT
3745  015426  005765  000040                   TST     FAC1(R5)
3746  015432  001037                           BNE     ERRSS1
3747  015434  016565  000042  000024           MOV     FAC2(R5),SS1SAV(R5)
3748  015442  100433                           BMI     ERRSS1
3749  015444  112102                           MOVB    (R1)+,R2
3750  015446  120227  000237                   CMPB    R2,#,RPAR
3751  015452  001422                           BEQ     NOSUBS
3752  015454  120227  000243                   CMPB    R2,#,COMMA
3753  015460  001020                           BNE     ERRSX3
3754  015462  004767  173714                   JSR     PC,EVAL
3755
3756                                           .IFNDF  $NOSTK
3757  015466  103417                           BCS     ERRMX3
3758                                           .ENDC
3759
3760  015470  004767  000100                   JSR     PC,INT
3761  015474  005765  000040                   TST     FAC1(R5)
3762  015500  001014                           BNE     ERRSS1
3763  015502  016565  000042  000026           MOV     FAC2(R5),SS2SAV(R5)
3764  015510  100410                           BMI     ERRSS1
3765  015512  122127  000237                   CMPB    (R1)+,#,RPAR
3766  015516  001001                           BNE     ERRSX3
3767  015520  000207                 NOSUBS: RTS     PC
3768  015522  000167  175016           ERRSX3: JMP     ERRSX5
3769
3770                                           .IFNDF  $NOSTK
3771  015526  000167  175200           ERRMX3: JMP     ERRMIX
3772                                           .ENDC
3773
3774  015532  000167  174360           ERRSS1: JMP     ERRSS2
3775
```

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```
3776                                    ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3777                                    ;
3778                                    ; INITBF = INIT, BUFFER HDRS,
3779                                    ;
3780                                    ; CALL: MOV     #[WDR, ADDR,],R2
3781                                    ;       JSR     PC,INITBF
3782                                    ;
3783                                    ;  USES R2,R3
3784                                    ;
3785                                    ;  LEAVES R3 POINTING TO WORD AFTER LAST IN BUFF, HDR,
3786                                    ;
3787  015536  012203                   INITBF: MOV     (R2)+,R3        ;BUFF, START ADDR,
3788  015540  005722                           TST     (R2)+           ;PT, TO BGET1
3789  015542  010322                           MOV     R3,(R2)+
3790  015544  005722                           TST     (R2)+           ;PT, TO BPUT
3791  015546  010322                           MOV     R3,(R2)+
3792  015550  005022                           CLR     (R2)+           ;BFSPEC
3793  015552  000207                           RTS     PC
3794
3795
3796
3797
3798                                    ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
3799                                    ;
3800                                    ; INITSCR = SCRATCH USER AREA
3801                                    ;
3802                                    ; CALL: JSR     PC,INITSCR
3803                                    ;
3804                                    ;  USES R0
3805                                    ;
3806  015554  016500  000016           INITSCR:MOV     CODE(R5),R0
3807  015560  012720  000225                   MOV     #EOF,(R0)+
3808  015564  010015                           MOV     R0,(R5)
3809  015566  010065  000014                   MOV     R0,LOFREE(R5)
3810  015572  000207                           RTS     PC
3811
```

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```
                                        ;+++++++
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```
3908                                    ;-----------------------------------------------------------
3909                                    ;
3910                                    ; LINGET - EDIT A LINE INTO LINE BUFFER USING GETCHAR
3911                                    ;
3912                                    ; CALL: USER AREA BASE INTO R5
3913                                    ;       JSR     PC,LINGET
3914                                    ;
3915                                    ;  PRESERVES ALL REGISTERS
3916                                    ;
3917                                    ;  RECOGNIZES '@' AND <RUB OUT> FOR RUB OUT AND <ALT MODE>
3918                                    ;   AND '^U' FOR LINE DELETE; <CR> AS LINE TERMINATOR,
3919                                    ;   THROWS AWAY ALL OTHERS BELOW ASCII 40 AND ABOVE
3920                                    ;   ASCII 137.
3921                                    ;
3922  016134  004567  002732           LINGET: JSR     R5,SAVREG       ;SAVE REGS,
3923  016140  116500  000077           LINA:   MOVB    IDEV(R5),R0     ;CURR. INPUT DEV, CODE
3924  016144  016001  016250                   MOV     TAB3(R0),R1     ;TO SELECT DEV,
3925  016150  005700                           TST     R0
3926  016152  001002                           BNE     LINEIN
3927  016154  060501                           ADD     R5,R1           ;USER BASE
3928  016156  011101                           MOV     (R1),R1         ;HAVE USER BUFF. HDR,
3929  016160  016502  000020           LINEIN: MOV     LINE(R5),R2
3930  016164  020265  000020           LINRUB: CMP     R2,LINE(R5)     ;DON'T RUB OUT TOO MUCH
3931  016170  001401                           BEQ     DOCHAR
3932  016172  005302                           DEC     R2
3933  016174  004767  177030           DOCHAR: JSR     PC,GETCHAR      ;DON'T COME BACK 'TILL YOU GOT ONE
3934  016200  103001                           BCC     GOTONE
3935  016202  000207                           RTS     PC              ;INDICATE INCOMPLETE LINE (CARRY SET)
3936  016204  110012           GOTONE: MOVB    R0,(R2)         ;PUT HER IN
3937  016206  004367  172370                   JSR     R3,CHKCHR       ;RETURN EXEC, ONE OF NEXT FIVE LOCS,
3938  016212  000752                           BR      LINA            ;IF LINE DELETE
3939  016214  000207                           RTS     PC              ;DONE (<CR>) (CARRY CLEAR)
3940  016216  000762                           BR      LINRUB
3941  016220  000765                           BR      DOCHAR          ;MEANINGLESS CHARS,
3942  016222  005202                           INC     R2              ;GOOD CHAR,
3943  016224  020265  000016                   CMP     R2,CODE(R5)     ;CHECK LINE SPACE OVERFLOW
3944  016230  103761                           BLO     DOCHAR
3945  016232  004167  001206                   JSR     R1,MSGERR
3946  016236     015     012                   ,BYTE   CR,LF
3947                                          ,IFNDF  $LONGER
3948  016240  052114     114                   ,ASCII  'LTL'
3949                                          ,ENDC
3950                                          ,IFDF   $LONGER
3951                                          ,ASCII  'LINE TOO LONG'
3952                                          ,ENDC
3953  016243     015     012                   ,BYTE   CR,LF
3954  016245     000                           ,BYTE   0
3955                                          ,EVEN
3956  016246  000744                           BR      LINEIN
3957                                    ;
3958                                    TAB3:
3959  016250  000102                           .       KBWD
3960                                          ,IFNDF $NOPTP
3961  016252  023714                           .       PRBFWD
3962                                          ,ENDC
```

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3963
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```
                                        ;+-----------------------------------------------
                                        ; 'LITEVAL' SUBROUTINE
                                        ;               CALLED BY JSR PC,LITEVAL
                                        ;               R4 POINTS TO THE CODE
                                        ;               THIS SUBROUTINE IS CALLED TO EVALUATE A
                                        ;               LITERAL IN THE CODE,
                                        ;
016254  005000                  LITEVAL:CLR     R0
016256  005065  000040                  CLR     FAC1(R5)
016262  005065  000042                  CLR     FAC2(R5)
016266  121327  000232                  CMPB    (R3),#,PLUS
016272  001404                          BEQ     LEVPLUS
016274  121327  000234                  CMPB    (R3),#,MINUS
016300  001002                          BNE     LEVLIT
016302  005100                          COM     R0
016304  005203                  LEVPLUS:INC     R3
016306  122327  000375          LEVLIT: CMPB    (R3)+,#,ILIT1
016312  001416                          BEQ     LEV1LT
016314  124327  000374                  CMPB    -(R3),#,FLIT
016320  001404                          BEQ     LEVFLT
016322  122327  000376                  CMPB    (R3)+,#,ILIT2
016326  001406                          BEQ     LEV2LT
016330  000207                          RTS     PC
016332  005203                  LEVFLT: INC     R3
016334  112365  000041                  MOVB    (R3)+,FAC1+1(R5)
016340  112365  000040                  MOVB    (R3)+,FAC1(R5)
016344  112365  000043          LEV2LT: MOVB    (R3)+,FAC2+1(R5)
016350  112365  000042          LEV1LT: MOVB    (R3)+,FAC2(R5)
016354  005700                          TST     R0
016356  001411                          BEQ     LEVPOS
016360  005765  000040                  TST     FAC1(R5)
016364  001003                          BNE     LEVFNEG
016366  005465  000042                  NEG     FAC2(R5)
016372  000403                          BR      LEVPOS
016374  062765  100000  000040  LEVFNEG:ADD     #100000,FAC1(R5)
016402  062716  000002          LEVPOS: ADD     #2,(SP)
016406  000207                          RTS     PC
```

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                                        ;+-----------------------------------------------
                                        ; SUBROUTINE 'LOCGET'  CALLED BY JSR PC
                                        ;                      GETS LOC OF ELEMENT IN ARRAY (CHECKS SUBSCRIPTS)
                                        ;                      R0  MUST CONTAIN SS1     GETS DESTROYED
                                        ;                      R1  UNUSED
                                        ;                      R2  MUST POINT TO VAR    GETS SET TO RESULT
                                        ;                      R3  MUST CONTAIN SS2     GETS DESTROYED
                                        ;                      R4  UNUSED
                                        ;                      R5  MUST POINT TO USER AREA
                                        ;                      SP  GOES ?? DEEPER AFTER JSR
                                        ;
016410  021227  177775          LOCGET: CMP     (R2),#,SCALAR
016414  001403                          BEQ     LOCALOC
016416  005762  000004                  TST     4(R2)
016422  100017                          BPL     LOCSS1
016424  010246                  LOCALOC:MOV     R2,-(SP)
016426  010446                          MOV     R4,-(SP)
016430  010346                          MOV     R3,-(SP)
                                
                                        .IFNDF  $NOSTK
016432  004767  172550                  JSR     PC,UNPACK
                                        .ENDC
                                
016436  012703  000012                  MOV     #12,R3
016442  011604                          MOV     (SP),R4
016444  100401                          BMI     .+4
016446  010304                          MOV     R3,R4
016450  004767  171334                  JSR     PC,ALLOC
016454  012603                          MOV     (SP)+,R3
016456  012604                          MOV     (SP)+,R4
016460  012602                          MOV     (SP)+,R2
016462  020062  000004          LOCSS1: CMP     R0,4(R2)
016466  101043                          BHI     ERRSS3
016470  005703                          TST     R3
016472  100427                          BMI     LOCN02
016474  005762  000006                  TST     6(R2)
016500  100436                          BMI     ERRSS3
016502  020362  000006                  CMP     R3,6(R2)
016506  101033                          BHI     ERRSS3
016510  016246  000004                  MOV     4(R2),-(SP)             ;****
016514  005216                          INC     (SP)                    ;*  *
016516  010346                          MOV     R3,-(SP)                ;*  *
016520  012746  000020                  MOV     #20,-(SP)               ;*  *
016524  006303          LOCLOOP:ASL     R3                              ;*  *
016526  006366  000002                  ASL     2(SP)                   ;*  *  MYULTIPLY SS2 BY SS1MAX
016532  103002                          BCC     .+6                     ;*  *  RESULT IN R3
016534  066603  000004                  ADD     4(SP),R3                ;*  *
016540  005316                          DEC     (SP)                    ;*  *
016542  003370                          BGT     LOCLOOP                 ;*  *
016544  022626                          CMP     (SP)+,(SP)+             ;*  *
016546  005726                          TST     (SP)+                   ;****
016550  060300                          ADD     R3,R0
016552  005200          LOCN02: INC     R0
016554  006300                  ASL     R0
                                
                                        .IFNDF  $NOSTK
```

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```
4056  016556  021227  177777                  CMP     (R2),#,SVAR
4057  016562  001401                          BEQ     ,+4
4058                                          ,ENDC
4059
4060  016564  006300                          ASL     R0
4061  016566  016202  000002                  MOV     2(R2),R2
4062  016572  060002                          ADD     R0,R2
4063  016574  000207                          RTS     PC
4064  016576  000004              ERRSS3:     IOT
4065                                          ,IFNDF  $LONGER
4066  016600  047523     102                  ,ASCII  \SOB\
4067                                          ,ENDC
4068                                          ,IFDF   $LONGER
4069                                          ,ASCII  'SUBSCRIPT OUT OF BOUNDS'
4070                                          ,ENDC
4071  016603     000                          ,BYTE 0
4072                                          ,EVEN
4073                                          ,EOT
4074
```

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```
4075                                  ;                                       SOURCE FILE #7
4076                                  ;+-------------------------------------------------------
4077                                  ;  SUBROUTINE 'LSTPROG' CALLED BY JSR PC
4078                                  ;                                       LISTS THE USER PROGRAM THROUGH 'PUTCHAR'
4079                                  ;                                           R0 - R4 DESTROYED
4080                                  ;                                   R5  MUST POINT TO USER AREA
4081                                  ;                                   SP  GOES ?? DEEPER AFTER JSR
4082  016604  016501  000016          LSTPROG:MOV     CODE(R5),R1
4083  016610  112102                  LSTLOOP:MOVB    (R1)+,R2
4084  016612  002142                          BGE     LSTPTR
4085  016614  120227  000201                  CMPB    R2,#,EOL
4086  016620  001444                          BEQ     LSTEOL
4087  016622  120227  000225                  CMPB    R2,#,EOF
4088  016626  001001                          BNE     ,+4
4089  016630  000207                          RTS     PC
4090  016632  120227  000374                  CMPB    R2,#,FLIT
4091  016636  103064                          BHIS    LSTSPEC
4092  016640  042702  177400                  BIC     #177400,R2
4093  016644  010703                          MOV     PC,R3
4094  016646  062703  161536          LSTPC:  ADD     #KEYWDS-LSTPC,R3
4095  016652  010304                  LSTSRCH:MOV     R3,R4           ;R4 IS START OF KEYWORD
4096  016654  112300                          MOVB    (R3)+,R0
4097  016656  100376                          BPL     ,-2             ;LOOP TILL GET END KEYWORD
4098  016660  120002                          CMPB    R0,R2           ;COMPARE VALUES
4099  016662  001373                          BNE     LSTSRCH
4100  016664  112400                  LSTKWD: MOVB    (R4)+,R0
4101  016666  100403                          BMI     LSTCHK
4102  016670  004767  002012                  JSR     PC,PUTCHAR
4103  016674  000773                          BR      LSTKWD
4104  016676  124127  000211          LSTCHK: CMPB    -(R1),#,NEXT
4105  016702  001410                          BEQ     LSTNEXT
4106  016704  122127  000202                  CMPB    (R1)+,#,FN
4107  016710  001337                          BNE     LSTLOOP
4108  016712  112100                  LSTFN:  MOVB    (R1)+,R0
4109  016714  062700  000200                  ADD     #'A+'A-2,R0
4110  016720  006000                          ROR     R0
4111  016722  000427                          BR      LSTCHAR
4112  016724  062701  000013          LSTNEXT:ADD     #13,R1
4113  016730  000727                          BR      LSTLOOP
4114  016732  111102                  LSTEOL: MOVB    (R1),R2
4115  016734  100010                          BPL     LSTLIN
4116  016736  120227  000225                  CMPB    R2,#,EOF
4117  016742  001015                          BNE     LSTBSLH
4118  016744  004167  000530          LSTCRLF:JSR     R1,MSGODEV
4119  016750     015     012     000          ,BYTE   CR,LF,0
4120                  016754                  ,EVEN
4121  016754  000715                          BR      LSTLOOP
4122  016756  000302                  LSTLIN: SWAB    R2
4123  016760  005201                          INC     R1
4124  016762  151102                          BISB    (R1),R2
4125  016764  005301                          DEC     R1
4126  016766  061502                          ADD     (R5),R2
4127  016770  021227  177775                  CMP     (R2),#,SCALAR
4128  016774  103763                          BLO     LSTCRLF
4129  016776  012700  000134          LSTBSLH:MOV     #'\,R0
```

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```
 4130  017002  004767  001700          LST$CHAR:JSR     PC,PUTCHAR
 4131  017006  000788                  BR      LST$LOOP
 4132  017010  120227  000374          LST$SPEC:CMPB    R2,#.FLIT
 4133  017014  001425                  BEQ     LST$FLIT
 4134  017016  120227  000376                  CMPB    R2,#.ILIT2
 4135  017022  103406                  BLO     LST$IL1
 4136  017024  001412                  BEQ     LST$IL2
 4137  017026  112100          LST$TEXT:MOVB    (R1)+,R0
 4138  017030  001667                  BEQ     LST$LOOP
 4139  017032  004767  001650          JSR     PC,PUTCHAR
 4140  017036  000773                  BR      LST$TEXT
 4141  017040  105065  000043          LST$IL1: CLRB    FAC2+1(R5)
 4142  017044  112165  000042                  MOVB    (R1)+,FAC2(R5)
 4143  017050  000404                  BR      LST$IL8
 4144  017052  112165  000043          LST$IL2: MOVB    (R1)+,FAC2+1(R5)
 4145  017056  112165  000042                  MOVB    (R1)+,FAC2(R5)
 4146  017062  005065  000040          LST$IL8: CLR     FAC1(R5)
 4147  017066  000410                  BR      LST$FL8
 4148  017070  112165  000041          LST$FLIT:MOVB    (R1)+,FAC1+1(R5)
 4149  017074  112165  000040                  MOVB    (R1)+,FAC1(R5)
 4150  017100  112165  000043                  MOVB    (R1)+,FAC2+1(R5)
 4151  017104  112165  000042                  MOVB    (R1)+,FAC2(R5)
 4152  017110  004767  000610          LST$FL8: JSR     PC,NUMOUT
 4153  017114  000167  177470          LST$JMP: JMP     LST$LOOP
 4154  017120  000302                  LST$PTR: SWAB    R2
 4155  017122  152102                  BISB    (R1)+,R2
 4156  017124  061502                  ADD     (R5),R2
 4157  017126  021227  177775                  CMP     (R2),#,SCALAR
 4158  017132  103030                  BHIS    LST$VAR
 4159  017134  011202                  MOV     (R2),R2
 4160  017136  002405                  BLT     LST$LNO
 4161  017140  010265  000042                  MOV     R2,FAC2(R5)
 4162  017144  005065  000040                  CLR     FAC1(R5)
 4163  017150  000414                  BR      LST$LNX
 4164  017152  110265  000043          LST$LNO: MOVB    R2,FAC2+1(R5)
 4165  017156  105065  000042                  CLRB    FAC2(R5)
 4166  017162  000302                  SWAB    R2
 4167  017164  110265  000040                  MOVB    R2,FAC1(R5)
 4168  017170  105065  000041                  CLRB    FAC1+1(R5)
 4169  017174  062765  043600  000040          ADD     #43600,FAC1(R5)
 4170  017202  004767  000516          LST$LNX: JSR     PC,NUMOUT
 4171  017206  012700  000040                  MOV     #BL,R0
 4172  017212  000673                  BR      LST$CHAR
 4173  017214  116200  000010          LST$VAR: MOVB    10(R2),R0
 4174  017220  004767  001402                  JSR     PC,PUTCHAR
 4175  017224  116200  000011                  MOVB    11(R2),R0
 4176  017230  001402                  BEQ     .+6
 4177  017232  004767  001450                  JSR     PC,PUTCHAR
 4178
 4179                                          .IFDF   $NOSTR
 4180                                          BR      LST$JMP
 4181                                          .ENDC
 4182                                          .IFNDF  $NOSTR
 4183  017236  021227  177777                  CMP     (R2),#,SVAR
 4184  017242  001324                  BNE     LST$JMP
```



```
 4185  017244  012700  000044                  MOV     #'$,R0
 4186  017250  000654                  BR      LST$CHAR
 4187                                          .ENDC
 4188
```

```
                                        .IFNDF  $NOSTR

                                ;-----------------------------------------------
                                ;  SUBROUTINE 'MAKESTR' CALLED BY JSR PC
                                ;                       MAKES A BASIC STRING FROM A STRING OF CHARACTERS
                                ;                       R0  DESTROYED
                                ;                       R1  UNUSED
                                ;                       R2  MUST POINT TO A WORD WHICH CONTAINS 3 LESS
                                ;                           THAN THE ADDRESS OF THE FIRST CHARACTER
                                ;                       R3  DESTROYED
                                ;                       R4  UNUSED
                                ;                       R5  MUST POINT TO USER AREA
                                ;                       SP  ON ENTRY 0(SP) MUST CONTAIN # CHARACTERS
                                ;                           ON EXIT 2(SP) CONTAINS POINTER TO THE STRING
017252  004767  000112          MAKESTR:JSR     PC,MAKETRY      ;WILL NEW STRING FIT?
017256  101413                          BLOS    MAKGOT          ;YES
017260  004767  171722                  JSR     PC,DNPACK       ;NO, GARBAGE COLLECT
017264  004767  000100                  JSR     PC,MAKETRY      ;TRY AGAIN
017270  101406                          BLOS    MAKGOT          ;FITS THIS TIME
017272  000004          ERRSOV: IOT
                                        .IFNDF  $LONGER
017274  051523     117                  .ASCII  \$SO\
                                        .ENDC
                                        .IFDF   $LONGER
                                        .ASCII  'STRING STORAGE OVERFLOW'
                                        .ENDC
017277     000                          .BYTE 0
                                        .EVEN
017300  004767  000064          MAKCHK: JSR     PC,MAKETRY
017304  101372                          BHI     ERRSOV
017306  010065  000074          MAKGOT: MOV     R0,HISTR(R5)    ;SAVE NEW HIGH STRING ADDR
017312  016600  000002                  MOV     2(SP),R0        ;R0 NOW CONTAINS # CHARS,
017316  011202                          MOV     (R2),R2
017320  062702  000003                  ADD     #3,R2           ;R2 NOW CONTAINS ADDRESS OF CHARS,
017324  110023                          MOVB    R0,(R3)+                ;R3 PUTS CHARACTERS IN
017326  122323                          CMPB    (R3)+,(R3)+
017330  112223                          MOVB    (R2)+,(R3)+
017332  005300                          DEC     R0
017334  003375                          BGT     .-4
017336  016600  000002                  MOV     2(SP),R0
017342  110013                          MOVB    R0,(R3)
017344  160003                          SUB     R0,R3
017346  010600                          MOV     SP,R0
017350  005720                          TST     (R0)+
017352  110043                          MOVB    R0,-(R3)
017354  000300                          SWAB    R0
017356  110043                          MOVB    R0,-(R3)
017360  005303                          DEC     R3
017362  010366  000002                  MOV     R3,2(SP)
017366  000207                          RTS     PC

                                ;       SUBROUTINE TO CHECK ROOM ENOUGH FOR STRING
017370  016500  000074          MAKETRY:MOV     HISTR(R5),R0
017374  010003                          MOV     R0,R3
017376  066600  000004                  ADD     4(SP),R0
```

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```
017402  062700  000004                  ADD     #4,R0
017406  020065  000012                  CMP     R0,HIFREE(R5)
017412  000207                          RTS     PC
                                        .ENDC



                                ;-----------------------------------------------
                                ;  SUBROUTINE 'MPYTEN'  CALLED BY JSR PC
                                ;                       MULTIPLIES R3,R4 BY DECIMAL 10
                                ;                       R0,R1,R2  UNUSED
                                ;                       R3,R4  IS THE 32 BIT UNSIGNED INTEGER TO MULTPLY
                                ;                       R5  UNUSED
                                ;                       SP  GOES 4 DEEPER AFTER JSR
017414  010346          MPYTEN: MOV     R3,-(SP)
017416  010446                  MOV     R4,-(SP)
017420  006304                  ASL     R4
017422  006103                  ROL     R3
017424  006304                  ASL     R4
017426  006103                  ROL     R3
017430  062604                  ADD     (SP)+,R4
017432  005503                  ADC     R3
017434  062603                  ADD     (SP)+,R3
017436  006304                  ASL     R4
017440  006103                  ROL     R3
017442  000207                  RTS     PC
```

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```
                                ;
                                ; MSG - OUTPUT A LINE TO TTY
                                ; MSGODEV - OUTPUT A LINE TO CURR. OUTPUT DEV.
                                ;
                                ; CALL: JSR     R1,MSG (MSGODEV)
                                ;       .ASCII  "[MESSAGE]"
                                ;       .BYTE   0
                                ;       .EVEN
                                ;                       ;RETURN HERE
                                ;
                                ;  USES R0
                                ;
                                ;  SET UP LINE WITH NUMBER OF BYTES TERMINATED
                                ;   BY A BYTE OF 000.
                                ;
                                MSGERR:
                                        .IFNDF  $LONGER
017444  112700  000045                  MOVB    #'%,R0
017450  000401                          BR      MSGCOM
                                        .ENDC
017452  112100                  MSG:    MOVB    (R1)+,R0
017454  105065  000107          MSGCOM: CLRB    CNOFLG(R5)
017460  016546  000034                  MOV     COLUMN(R5),-(SP)        ;SAVE FOR TEMP SWITCH
017464  012765  000036  000034          MOV     #CLMNTTY,COLUMN(R5)
017472  060565  000034                  ADD     R5,COLUMN(R5)
017476  000404                          BR      FRSTOUT
017500  016546  000034          MSGODEV:MOV     COLUMN(R5),-(SP)
017504  112100                  DOMSG:  MOVB    (R1)+,R0
017506  001403                          BEQ     LINDUN
017510  004767  001172          FRSTOUT:JSR     PC,PUTCHAR              ;PUT CHAR, TO TTY
017514  000773                          BR      DOMSG           ;DO NEXT CHAR
017516  005201                  LINDUN: INC     R1              ;TO INSURE RETURN ON
017520  006201                          ASR     R1              ;  EVEN WORD BOUNDARY
017522  006301                          ASL     R1
017524  012665  000034                  MOV     (SP)+,COLUMN(R5)
017530  000201                          RTS     R1
```

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```
                                ;*************************************************
                                ;  SUBROUTINE 'NORM'    NORMALIZES INTEGER CONTAINED IN
                                ;                       R3 AND R4, MULTIPLIED BY EXPONENT
                                ;                       IN R2,  ANSWER IS IN R3, R4,
                                ;                       CALLED BY JSR PC
017532  012746  000237          NORM:   MOV     #237,-(SP)
017536  005703                          TST     R3
017540  001413                          BEQ     LITTST
017542  100003                          BPL     LITNORM
017544  006003                          ROR     R3
017546  006004                          ROR     R4
017550  005216                          INC     (SP)
017552  030327  040000          LITNORM:BIT     R3,#40000
017556  001010                          BNE     LITOK
017560  006304                          ASL     R4
017562  006103                          ROL     R3
017564  005316                          DEC     (SP)
017566  000771                          BR      LITNORM
017570  005704                  LITTST: TST     R4
017572  001367                          BNE     LITNORM
017574  005726                          TST     (SP)+
017576  000207                          RTS     PC
017600  005702                  LITOK:  TST     R2
017602  001425                          BEQ     LITSTO
017604  100416                          BMI     LITDIV
017606  006203                          ASR     R3
017610  006004                          ROR     R4
017612  006203                          ASR     R3
017614  006004                          ROR     R4
017616  006203                          ASR     R3
017620  006004                          ROR     R4
017622  006203                          ASR     R3
017624  006004                          ROR     R4
017626  062716  000004                  ADD     #4,(SP)
017632  004767  177556                  JSR     PC,MPYTEN
017636  005302                          DEC     R2
017640  000744                          BR      LITNORM
017642  004767  171302          LITDIV: JSR     PC,DIVTEN
017646  005202                          INC     R2
017650  000740                          BR      LITNORM
017652  006203                  LITSHR: ASR     R3
017654  006004                          ROR     R4
017656  030327  177000          LITSTO: BIT     R3,#177000
017662  001373                          BNE     LITSHR
017664  005716                          TST     (SP)
017666  003002                          BGT     .+6
017670  012716  000001                  MOV     #1,(SP)
017674  021627  000377                  CMP     (SP),#377
017700  101402                          BLOS    .+6
017702  012716  000377                  MOV     #377,(SP)
017706  110366  000001                  MOVB    R3,1(SP)
017712  012603                          MOV     (SP)+,R3
017714  000303                          SWAB    R3
017716  006003                          ROR     R3
017720  006004                          ROR     R4
```

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```
 4364  017722  000207                        RTS     PC
 4365
```

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```
 4366                                ;-------------------------------------------------------
 4367                                ;  'NUMOUT' SUBROUTINE
 4368                                ;               CALLED BY JSR PC,NUMOUT
 4369                                ;               OUTPUTS AN UNSIGNED NUMBER FROM THE FAC
 4370                                ;               VIA THE SUBROUTINE PUTCHAR;
 4371  017724  004567  001142       NUMOUT: JSR     R5,SAVREG
 4372  017730  012701  020706               MOV     #PUTCHAR,R1
 4373  017734  000446                       BR      NUMSTI
 4374
 4375
 4376                                ;-------------------------------------------------------
 4377                                ;  'NUMSGN' SUBROUTINE
 4378                                ;               CALLED BY JSR PC,NUMSGN
 4379                                ;                       ;WORD OUTPUT
 4380                                ;               WHERE OUTPUT IS THE OUTPUT ROUTINE,
 4381                                ;               WHICH MAY BE PUTCHAR OR SAVCHAR,
 4382                                ;               OUTPUTS A SIGNED NUMBER FROM THE
 4383                                ;               FAC VIA THE OUTPUT ROUTINE,
 4384  017736  017600  000000       NUMSGN: MOV     @(SP),R0
 4385  017742  062716  000002               ADD     #2,(SP)
 4386  017746  004567  001120               JSR     R5,SAVREG
 4387  017752  010001                       MOV     R0,R1
 4388  017754  005765  000040               TST     FAC1(R5)
 4389  017760  001418                       BEQ     NUMFIX
 4390  017762  100025                       BPL     NUMPOS
 4391  017764  062765  100000  000040       ADD     #100000,FAC1(R5)
 4392  017772  001016                       BNE     NUMNEG
 4393  017774  005065  000042               CLR     FAC2(R5)
 4394  020000  001016                       BNE     NUMPOS
 4395  020002  005765  000042       NUMFIX: TST     FAC2(R5)
 4396  020006  100013                       BPL     NUMPOS
 4397  020010  005465  000042               NEG     FAC2(R5)
 4398  020014  102005                       BVC     NUMNEG
 4399  020016  012765  044000  000040       MOV     #44000,FAC1(R5)
 4400  020024  005065  000042               CLR     FAC2(R5)
 4401  020030  012700  000055       NUMNEG: MOV     #'-,R0
 4402  020034  000405                       BR      NUMPRS
 4403                                NUMPOS:
 4404                                        .IFNDF  $NOSTR
 4405  020036  020127  020570               CMP     R1,#SAVCHAR
 4406  020042  001403                       BEQ     NUMSTI          ;DON'T OUTPUT BLANK FOR STRS
 4407                                        .ENDC
 4408
 4409  020044  012700  000040               MOV     #BL,R0
 4410  020050  004711                NUMPRS: JSR     PC,(R1)
 4411
 4412                                NUMSTI:
 4413  020052  016504  000042               MOV     FAC2(R5),R4     ;R4 = LOW ORDER MANTISSA,
 4414  020056  005002                       CLR     R2              ;R2 = DECIMAL EXPONENT;
 4415  020060  016503  000040               MOV     FAC1(R5),R3     ;R3 = HIGH ORDER MANTISSA,
 4416  020064  001010                       BNE     NUMFLT
 4417  020066  012700  000037               MOV     #37,R0          ;R0 = BINARY EXPONENT,
 4418  020072  005704                       TST     R4
 4419  020074  001016                       BNE     NUMSHFT
 4420  020076  012700  000060               MOV     #'0,R0
```

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```
 4421  020102  004711                        JSR     PC,(R1)
 4422  020104  000207                        RTS     PC
 4423  020106  010300              NUMFLT:   MOV     R3,R0
 4424  020110  006300                        ASL     R0
 4425  020112  105000                        CLRB    R0
 4426  020114  000300                        SWAB    R0
 4427  020116  162700  000171              SUB     #171,R0
 4428  020122  042703  177600              BIC     #177600,R3
 4429  020126  052703  000200              BIS     #200,R3
 4430  020132  005300              NUMSHFT:  DEC     R0
 4431  020134  006304                        ASL     R4
 4432  020136  006103                        ROL     R3
 4433  020140  030327  040000      NUMNORM:  BIT     R3,#40000
 4434  020144  001772                        BEQ     NUMSHFT
 4435  020146  005700                        TST     R0
 4436  020150  003016                        BGT     NUMBIG
 4437  020152  006203                        ASR     R3
 4438  020154  006004                        ROR     R4
 4439  020156  006203                        ASR     R3
 4440  020160  006004                        ROR     R4
 4441  020162  006203                        ASR     R3
 4442  020164  006004                        ROR     R4
 4443  020166  006203                        ASR     R3
 4444  020170  006004                        ROR     R4
 4445  020172  062700  000004              ADD     #4,R0
 4446  020176  004767  177212              JSR     PC,MPYTEN
 4447  020202  005302                        DEC     R2
 4448  020204  000755                        BR      NUMNORM
 4449  020206  020027  000004      NUMBIG:   CMP     R0,#4
 4450  020212  003407                        BLE     NUMOK
 4451  020214  004767  170730      NUMDIV:   JSR     PC,DIVTEN
 4452  020220  005202                        INC     R2
 4453  020222  000746                        BR      NUMNORM
 4454  020224  005200              NUMALN:   INC     R0
 4455  020226  006203                        ASR     R3
 4456  020230  006004                        ROR     R4
 4457  020232  020027  000004      NUMOK:    CMP     R0,#4
 4458  020236  002772                        BLT     NUMALN
 4459  020240  020327  050000              CMP     R3,#50000
 4460  020244  103363                        BHIS    NUMDIV
 4461  020246  062704  001250              ADD     #1250,R4        ;ROUNDING
 4462  020252  103010                        BCC     NORNDOV
 4463  020254  005203                        INC     R3
 4464  020256  020327  050000              CMP     R3,#50000
 4465  020262  103404                        BLO     NORNDOV
 4466  020264  012703  004000              MOV     #4000,R3
 4467  020270  005004                        CLR     R4
 4468  020272  005202                        INC     R2
 4469  020274  012700  000006      NORNDOV:  MOV     #6,R0
 4470  020300  010346              NUMDIG:   MOV     R3,-(SP)
 4471  020302  000316                        SWAB    (SP)
 4472  020304  006016                        ROR     (SP)
 4473  020306  006016                        ROR     (SP)
 4474  020310  006016                        ROR     (SP)
 4475  020312  042716  177760              BIC     #177760,(SP)
```

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```
 4476  020316  062716  000060              ADD     #60,(SP)
 4477  020322  042703  174000              BIC     #174000,R3
 4478  020326  004767  177062              JSR     PC,MPYTEN
 4479  020332  005300                        DEC     R0
 4480  020334  003361                        BGT     NUMDIG
 4481  020336  010603                        MOV     SP,R3
 4482  020340  062703  000014              ADD     #14,R3
 4483  020344  020227  177776              CMP     R2,#-2
 4484  020350  002404                        BLT     NUMFM1
 4485  020352  001446                        BEQ     NUMFM2
 4486  020354  020227  000000              CMP     R2,#0
 4487  020360  002451                        BLT     NUMFM3
 4488  020362  014300              NUMFM1:   MOV     -(R3),R0
 4489  020364  004711                        JSR     PC,(R1)
 4490  020366  012700  000056              MOV     #'.,R0
 4491  020372  004711                        JSR     PC,(R1)
 4492  020374  012704  000005              MOV     #5,R4
 4493  020400  014300              NUMLP1:   MOV     -(R3),R0
 4494  020402  004711                        JSR     PC,(R1)
 4495  020404  005304                        DEC     R4
 4496  020406  003374                        BGT     NUMLP1
 4497  020410  012700  000105              MOV     #'E,R0
 4498  020414  004711                        JSR     PC,(R1)
 4499  020416  012700  000053              MOV     #'+,R0
 4500  020422  005702                        TST     R2
 4501  020424  100003                        BPL     .+10
 4502  020426  012700  000055              MOV     #'-,R0
 4503  020432  005402                        NEG     R2
 4504  020434  004711                        JSR     PC,(R1)
 4505  020436  012700  000060              MOV     #'0,R0
 4506  020442  162702  000012              SUB     #12,R2
 4507  020446  100402                        BMI     .+6
 4508  020450  005200                        INC     R0
 4509  020452  000773                        BR      .-10
 4510  020454  004711                        JSR     PC,(R1)
 4511  020456  010200                        MOV     R2,R0
 4512  020460  062700  000072              ADD     #'0+12,R0
 4513  020464  004711                        JSR     PC,(R1)
 4514  020466  000435                        BR      NUMEXIT
 4515  020470  012700  000056      NUMFM2:   MOV     #'.,R0
 4516  020474  004711                        JSR     PC,(R1)
 4517  020476  012700  000060              MOV     #'0,R0
 4518  020502  004711                        JSR     PC,(R1)
 4519  020504  012704  000006      NUMFM3:   MOV     #6,R4
 4520  020510  010600                        MOV     SP,R0
 4521  020512  022027  000060              CMP     (R0)+,#'0
 4522  020516  001002                        BNE     .+6
 4523  020520  005304                        DEC     R4
 4524  020522  000773                        BR      .-10
 4525  020524  020402                        CMP     R4,R2
 4526  020526  003002                        BGT     .+6
 4527  020530  010204                        MOV     R2,R4
 4528  020532  005204                        INC     R4
 4529  020534  005202                        INC     R2
 4530  020536  005202                        INC     R2
```

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```
4531  020540  005302                NUMLP3: DEC     R2
4532  020542  001003                        BNE     .+10
4533  020544  012700  000056              MOV     #'.,R0
4534  020550  004711                        JSR     PC,(R1)
4535  020552  014300                        MOV     -(R3),R0
4536  020554  004711                        JSR     PC,(R1)
4537
4538  020556  005304                        DEC     R4
4539  020560  003367                        BGT     NUMLP3
4540  020562  062706  000014        NUMEXIT:ADD     #14,SP
4541  020566  000207                        RTS     PC
4542
4543                                        .IFNDF  $NOSTM
4544                                SAVCHAR:
4545  020570  004567  000276                JSR     R5,$AVREG
4546  020574  016501  000060                MOV     T2(R5),R1
4547  020600  110021                        MOVB    R0,(R1)+
4548  020602  010165  000060                MOV     R1,T2(R5)
4549  020606  005265  000056                INC     T1(R5)
4550  020612  000207                        RTS     PC
4551                                        .ENDC
4552
```

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```
4553                                    ;
4554                                    ; PUTBYT - PUT BYTE INTO RING BUFFER
4555                                    ;
4556                                    ; CALL: MOV     [BUFF, HDR',],R1
4557                                    ;       MOV     [CHAR],R0
4558                                    ;       JSR     PC,PUTBYT
4559                                    ;
4560                                    ;  USES R0,R1,R2,R3
4561                                    ;
4562                                    ;  RAISE PRIORITY SINCE THIS MAY BE CALLED AT
4563                                    ;   MAINSTREAM, BUT ACCESSES POINTERS THAT MAY CHANGE AT
4564                                    ;   INTERUPT LEVEL.
4565                                    ;  RETURNS WITH 'C' BIT: CLR IF BYTE GOT IN
4566                                    ;                        SET IF NO ROOM
4567                                    ;
4568  020614  012702  177776        PUTBYT: MOV     #PS,R2
4569  020620  011246                        MOV     (R2),-(SP)      ;SAVE STATUS
4570  020622  012712  000340                MOV     #PR7,(R2)       ;REPLACE WITH HIGHEST
4571  020626  016103  000010                MOV     BPUT(R1),R3
4572  020632  005203                        INC     R3              ;CANDIDATE FOR NEW POSITION
4573  020634  020361  000002                CMP     R3,BEND(R1)     ;NEED TO WRAP AROUND?
4574  020640  101402                        BLOS    NOWRAP
4575  020642  016103  000000                MOV     BSTRT(R1),R3    ;YES! NEW POS, AT TOP
4576  020646  020361  000004        NOWRAP: CMP     R3,BGET1(R1)    ;IF EQUAL TO EITHER GET PTR,,
4577  020652  001412                        BEQ     NOROOM          ;  THEN NO ROOM
4578  020654  020361  000006                CMP     R3,BGET2(R1)
4579  020660  001407                        BEQ     NOROOM
4580  020662  113071  000010                MOVB    R0,@BPUT(R1)
4581  020666  010361  000010                MOV     R3,BPUT(R1)     ;UPDATE PTR,
4582  020672  012612                        MOV     (SP)+,(R2)      ;STATUS BACK
4583  020674  000241                        CLC                     ;SIGNAL SUCCESS
4584  020676  000207                        RTS     PC
4585  020700  012612                NOROOM: MOV     (SP)+,(R2)      ;STATUS BACK
4586  020702  000261                        SEC                     ;SHOW FAILURE
4587  020704  000207                        RTS     PC
4588
```

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```
4589                                    ;
4590                                    ; PUTCHAR = PUT CHAR TO CURRENT OUTPUT DEV,
4591                                    ;
4592                                    ; CALL: (LOAD ODEV(R5))
4593                                    ;       MOV     [CHAR],R0
4594                                    ;       JSR     PC,PUTCHAR
4595                                    ;
4596                                    ;  SAVES ALL REGS,
4597                                    ;
4598                                    ;  TRIES TO FIT CHAR INTO PROPER BUFFER.  GOES TO IOWAIT ON
4599                                    ;   FAILURE,
4600                                    ;
4601  020706  004567  000160            PUTCHAR:JSR     R5,SAVREG
4602  020712  012746  047777                    MOV     #47777,-(SP)    ;INIT TIME OUT COUNT
4603  020716  005275  000034                    INC     @COLUMN(R5)
4604  020722  105765  000100                    TSTB    CNCFLG(R5)
4605  020726  001402                            BEQ     PUTCCO
4606  020730  000167  160210                    JMP     READY
4607  020734  116504  000070            PUTCCO: MOVB    ODEV(R5),R4     ;OUTPUT DEVICE CODE
4608  020740  001003                            BNE     HDRSTUP         ;IF NOT TTY, CONTINUE
4609  020742  105765  000107                    TSTB    CNOFLG(R5)      ;CHECK FOR ^O/
4610  020746  001032                            BNE     OUT010          ;IF SET EXIT IMMEDIATELY
4611  020750  016401  021040            HDRSTUP:MOV     TAB1(R4),R1
4612  020754  005704                            TST     R4              ;WHICH DEVICE?
4613  020756  001002                            BNE     PUTIT           ;NOT TTY
4614  020760  060501                            ADD     R5,R1           ;NEED CURR, USER'S BUFF,
4615  020762  011101                            MOV     (R1),R1         ;NOW, ACTUAL HEADER
4616  020764  004767  177624            PUTIT:  JSR     PC,PUTBYT
4617  020770  103007                            BCC     ITSIN
4618  020772  004767  175104                    JSR     PC,IOWAIT       ;NO ROOM! WAIT
4619  020776  005316                            DEC     (SP)            ;TIME OUT
4620  021000  001371                            BNE     PUTIT
4621  021002  105061  000012                    CLRB    BFSPEC(R1)
4622  021006  000422                            BR      DEVERR
4623  021010  105061  000012            ITSIN:  CLRB    BFSPEC(R1)
4624  021014  012774  000100  021046            MOV     #100,@TAB2(R4)  ;ENABLE INTERUPT ON CHOSEN DEV,
4625  021022  005265  000070                    INC     RNDCT(R5)
4626  021026  105761  000012                    TSTB    BFSPEC(R1)      ;I/O ERROR?
4627  021032  001010                            BNE     DEVERR
4628  021034  005726                    OUT010: TST     (SP)+           ;POP TIME OUT COUNT
4629  021036  000207                            RTS     PC              ;RESTORES REGS, AND RETURNS
4630                                    ;
4631                                    ; TAB1 = DEV, BUFFER HDRS, (TPWD IS OFFSET INTO USRAREA
4632                                    ;  FOR ADDR, TO TPRTR, BUFF, HDR,)
4633                                    ;
4634  021040  000100                    TAB1:   .       TPWD
4635                                            .IFNDF $NOPTP
4636  021042  023760                            .       PPBFHD
4637                                            .ENDC
4638                                            .IFDF $NOPTP
4639                                            0
4640                                            .ENDC
4641
4642                                            .IFNDF $NOLPT
4643  021044  024024                            .       LPBFHD
```

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```
4644                                            .ENDC
4645
4646                                            .IFDF $NOLPT
4647                                            0
4648                                            .ENDC
4649                                    ;
4650                                    ; TAB2 = DEV, STATUS REG,
4651                                    ;
4652  021046  177564                    TAB2:   .       TPS
4653  021050  177554                            .       PPS
4654  021052  177514                            .       LPS
4655
4656  021054  000004                    DEVERR: IOT
4657                                            .IFNDF  $LONGER
4658  021056  047104      122                   .ASCII  \DNR\
4659                                            .ENDC
4660                                            .IFDF   $LONGER
4661                                            .ASCII  \DEVICE NOT READY\
4662                                            .ENDC
4663  021061      000                           .BYTE 0
4664                                            .EVEN
4665                                            .EOT
4666
```

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```
                                        ;                                SOURCE FILE #8
                                        ;*****************************************************
                                        ;
                                        ; SAVREG - SAVE ALL REGISTERS
                                        ;
                                        ; CALL: [JSR    PC,SUBR,]       ;MUST CALL SAVREG FROM SUBRTN,
                                        ;       JSR     R5,SAVREG
                                        ;
                                        ;  PUSHES ALL REGS, AND EXITS WITH ADDR, ON STACK
                                        ;   WHICH BRINGS CONTROL BACK WHEN SUBR, DOES (RTS      PC),
                                        ;   THEN, RESTORES REGS, AND DOES (RTS PC) WHICH RETURNS TO JUST
                                        ;   AFTER CALL TO INITIAL SUBROUTINE (MODIFIED BOWERING SPECIAL)
                                        ;
021062  011646                 SAVRG1: MOV     (SP),-(SP)
021064  012766  021132  000002          MOV     #INTEXT,2(SP)
021072  010446                 SAVREG: MOV     R4,-(SP)
021074  010346                         MOV     R3,-(SP)
021076  010246                         MOV     R2,-(SP)
021100  010146                         MOV     R1,-(SP)
021102  010046                         MOV     R0,-(SP)
021104  010546                         MOV     R5,-(SP)        ;FOR RETURN TO SUBR,
021106  016605  000014                 MOV     12.(SP),R5      ;GET OLD R5
021112  004736                         JSR     PC,@(SP)+       ;STACK NEXT LOC,!
021114  012600                 RESREG: MOV     (SP)+,R0
021116  012601                         MOV     (SP)+,R1
021120  012602                         MOV     (SP)+,R2
021122  012603                         MOV     (SP)+,R3
021124  012604                         MOV     (SP)+,R4
021126  012605                         MOV     (SP)+,R5
021130  000207                         RTS     PC              ;BACK TO CALLER OF INIT, SUBR,
                                        ;
021132  000002                 INTEXT: RTI
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;*****************************************************
                                        ;
                                        ; SCANPND - SCAN TOKEN FOR '#'
                                        ;
                                        ; CALL: MOV     [PTR, TO BYTE BEFORE '#' TOKEN],R1
                                        ;       JSR     PC,SCANPND
                                        ;
                                        ;  USES R1
                                        ;
021134  012765  177775  000030  SCANPND:MOV     #,SCALAR,LINENO(R5)
021142  005201                         INC     R1
021144  122127  000261                 CMPB    (R1)+,#,POUND
021150  001402                         BEQ     PNDGO
021152  000167  171366                 JMP     ERRSX5
021156  000207                 PNDGO:  RTS     PC
                                        ;
```

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                                        ;*****************************************************
                                        ;  SUBROUTINE 'SKIPEOL' CALLED BY JSR PC
                                        ;                       MOVES R1 PAST THE NEXT 'EOL'
                                        ;                       R0  UNUSED
                                        ;                       R1  MODIFIED TO REFLECT OPERATION
                                        ;                       R2,R3,R4,R5  UNUSED
                                        ;                       SP  GOES NO DEEPER AFTER JSR
021160  062701  000003          SKIP05: ADD     #3,R1
021164  005201                  SKIP02: INC     R1
021166  005201                  SKIP01: INC     R1
021170  105721                  SKIPEOL:TSTB    (R1)+
021172  002375                          BGE     SKIP01
021174  124127  000374                  CMPB    -(R1),#,FLIT
021200  001767                          BEQ     SKIP05
021202  101014                          BHI     SKIPHI
021204  122127  000201                  CMPB    (R1)+,#,EOL
021210  001420                          BEQ     SKIPRTS
021212  124127  000262                  CMPB    -(R1),#,FN
021216  001762                          BEQ     SKIP02
021220  122127  000211                  CMPB    (R1)+,#,NEXT
021224  001361                          BNE     SKIPEOL
021226  062701  000012                  ADD     #12,R1
021232  000756                          BR      SKIPEOL
                                        ;       EITHER ,ILIT1(375), ,ILIT2(376) OR ,TEXT(377)
021234  122127  000376          SKIPHI: CMPB    (R1)+,#,ILIT2
021240  001751                          BEQ     SKIP02
021242  103751                          BLO     SKIP01
021244  105721                  SKIPTXT:TSTB    (R1)+
021246  001376                          BNE     SKIPTXT
021250  000747                          BR      SKIPEOL
021252  000207                  SKIPRTS:RTS     PC
                                        ;
                                        ;
                                        ;
                                        ;*****************************************************
                                        ;  'STOVAR' SUBROUTINE
                                        ;               CALLED BY JSR PC,STOVAR
                                        ;               STORES FAC1, FAC2 IN THE VARIABLE OR
                                        ;               ARRAY ELEMENT LAST ADDRESSED BY THE
                                        ;               SUBROUTINE 'GETVAR'
021254  016502  000022          STOVAR: MOV     VARSAV(R5),R2
                                        ;
                                        ;       .IFNDF  $NOSTK
021260  021227  177777                  CMP     (R2),#,SVAR
021264  001421                          BEQ     ERRNX7
                                        ;       .ENDC
                                        ;
021266  016500  000024                  MOV     SS1SAV(R5),R0
021272  100405                          BMI     STONOSS
021274  016503  000026                  MOV     SS2SAV(R5),R3
021300  004767  175104                  JSR     PC,LOCGET
021304  000404                          BR      STOCOMM
021306  022227  177775          STONOSS:CMP     (R2)+,#,SCALAR
021312  001401                          BEQ     STOCOMM
021314  011202                          MOV     (R2),R2
```

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 4775  021316  016522  000040          STOCOMM:MOV     FAC1(R5),(R2)+
 4776  021322  016512  000042                  MOV     FAC2(R5),(R2)
 4777  021326  000207                          RTS     PC
 4778
 4779                                          .IFNDF  $NOSTR
 4780  021330  000167  171456          ERRMX7: JMP     ERRMIX
 4781                                          .ENDC
 4782
```

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```
 4783                                          .IFNDF  $NOSTR
 4784                                  ;*******************************************************
 4785                                  ;  'STOSVAR' SUBROUTINE
 4786                                  ;               CALLED BY JSR PC,STOSVAR
 4787                                  ;               STORES A STRING VARIABLE AS ADDRESSED BY
 4788                                  ;               VARSAV
 4789  021334  016502  000022          STOSVAR:MOV     VARSAV(R5),R2
 4790  021340  021227  177777                  CMP     (R2),#,SVAR
 4791  021344  001037                          BNE     ERRMX6
 4792  021346  016500  000024                  MOV     SS1SAV(R5),R0
 4793  021352  100405                          BMI     STOSSNO
 4794  021354  016503  000026                  MOV     SS2SAV(R5),R3
 4795  021360  004767  175024                  JSR     PC,LOCGET
 4796  021364  000406                          BR      STOMMCO
 4797  021366  005722          STOSSNO:TST     (R2)+
 4798  021370  026227  000002  177777          CMP     2(R2),#-1
 4799  021376  001405                          BEQ     STOVTAB
 4800  021400  011202                          MOV     (R2),R2
 4801  021402  012603          STOMMCO:MOV     (SP)+,R3
 4802  021404  012600                          MOV     (SP)+,R0
 4803  021406  010012                          MOV     R0,(R2)
 4804  021410  000405                          BR      STOVCOM
 4805  021412  012603          STOVTAB:MOV     (SP)+,R3
 4806  021414  012600                          MOV     (SP)+,R0
 4807  021416  010012                          MOV     R0,(R2)
 4808  021420  005202                          INC     R2
 4809  021422  161502                          SUB     (R5),R2
 4810  021424  005200          STOVCOM:INC     R0
 4811  021426  001405                          BEQ     STOSX           ;CHECK NULL STRING
 4812  021430  062700  000002                  ADD     #2,R0
 4813  021434  110240                          MOVB    R2,-(R0)
 4814  021436  000302                          SWAB    R2
 4815  021440  110240                          MOVB    R2,-(R0)
 4816  021442  000113          STOSX:  JMP     (R3)
 4817  021444  000167  171342  ERRMX6: JMP     ERRMIX
 4818                                          .ENDC
 4819
 4820
 4821
 4822
 4823                                  ;*******************************************************
 4824                                  ;  SUBROUTINE 'SUBSTK'  CALLED BY JSR PC
 4825                                  ;                       NEGATES 2(SP),2(SP) THEN CONTINUES IN 'ADDSTK'
 4826                                  ;                       R0,R1  UNUSED
 4827                                  ;                       R2,R3  DESTROYED
 4828                                  ;                       R4  MODIFIED TO REFLECT STACK USAGE
 4829                                  ;                       R5  MUST POINT TO USER AREA
 4830                                  ;                       SP  GOES 2? DEEPER AFTER JSR
 4831  021450  005766  000002          SUBSTK: TST     2(SP)
 4832  021454  001405                          BEQ     SUBINT
 4833  021456  062766  100000  000002          ADD     #100000,2(SP)
 4834  021464  000167  166132          ADDSTK: JMP     ADDSTK
 4835  021470  005466  000004          SUBINT: NEG     4(SP)
 4836  021474  102373                          BVC     ADDSTK
 4837  021476  012766  044000  000002          MOV     #44000,2(SP)
```

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 4838  021504  205066  000004          CLR     4(SP)
 4839  021510  000765                  BR      ADSTK1
 4840
```

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 4841                                  ;+-----------------------------------------------
 4842                                  ;  'TRAN' SUBROUTINE
 4843                                  ;               CALLED BY JSR PC,TRAN
 4844                                  ;               TRANSLATES FROM INPUT ASCII CODE
 4845                                  ;               TO INTERNAL CODE, CONSISTING OF TOKENS,
 4846                                  ;               LINE NUMBER REFERENCES, SYMBOL TABLE
 4847                                  ;               REFERENCES, AND LITERALS.  ALWAYS RETURNS,
 4848                                  ;               NO MATTER WHAT IS INPUT,
 4849                                  ;               AS NEW SYMBOLS ARE ENCOUNTERED, BUILDS NEW
 4850                                  ;               ENTRIES INTO THE SYMBOL TABLE,
 4851                                  ;               ERRORS ARE TRANSLATED TO C,TEXT,,,;)
 4852  021512  016502  000020  TRAN:   MOV     LINE(R5),R2
 4853  021516  010201                  MOV     R2,R1
 4854  021520  122127  000015          CMPB    (R1)+,#CR
 4855  021524  001375                  BNE     .-4
 4856  021526  016500  000016          MOV     CODE(R5),R0
 4857  021532  114140                  MOVB    -(R1),-(R0)
 4858  021534  020102                  CMP     R1,R2           ;R0 IS WHERE ORIGINAL TEXT IS,
 4859  021536  001375                  BNE     .-4             ;R1 IS WHERE TRANSLATED TEXT GOES,
 4860  021540  005065  000056  TRANLUP:CLR     T1(R5)          ;PREVIOUS ITEM WASN'T A VAR,
 4861  021544  122027  000040  TRANVAR:CMPB    (R0)+,#BL
 4862  021550  001775                  BEQ     TRANVAR
 4863  021552  124027  000015          CMPB    -(R0),#CR
 4864  021556  001003                  BNE     TRYNUM
 4865  021560  112711  000201          MOVB    #EOL,(R1)
 4866  021564  000207                  RTS     PC
 4867  021566  121027  000056  TRYNUM: CMPB    (R0),#'.
 4868  021572  001406                  BEQ     NUMJMP
 4869  021574  121027  000060          CMPB    (R0),#'0
 4870  021600  103405                  BLO     TRYKWD
 4871  021602  121027  000071          CMPB    (R0),#'9
 4872  021606  101002                  BHI     TRYKWD
 4873  021610  000167  000730  NUMJMP: JMP     ISNUM
 4874
 4875  021614  012704  156542  TRYKWD: MOV     #KEYWDS-TRNPC,R4
 4876  021620  121027  000101          CMPB    (R0),#'A        ;CHECK ALPHA KEYWORDS
 4877  021624  103405                  BLO     COMTAB  ;TOO LOW
 4878  021626  121027  000132          CMPB    (R0),#'Z
 4879  021632  101002                  BHI     COMTAB  ;TOO HIGH
 4880  021634  012704  156634          MOV     #KEYA-TRNPC,R4  ;JUST RIGHT
 4881  021640  010703  COMTAB: MOV     PC,R3
 4882  021642  060403  TRNPC:  ADD     R4,R3           ;ADDRESS TABLE
 4883  021644  010002  TRYAGN: MOV     R0,R2
 4884  021646  122223  RETRY:  CMPB    (R2)+,(R3)+
 4885  021650  001776                  BEQ     RETRY
 4886  021652  114304                  MOVB    -(R3),R4
 4887  021654  100414                  BMI     AMATCH
 4888  021656  001550                  BEQ     NOTKWD
 4889  021660  005302                  DEC     R2
 4890  021662  122227  000040          CMPB    (R2)+,#BL
 4891  021666  001767                  BEQ     RETRY
 4892  021670  005302                  DEC     R2
 4893  021672  122327  000040          CMPB    (R3)+,#BL
 4894  021676  001763                  BEQ     RETRY
 4895  021700  105723                  TSTB    (R3)+
```

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 4896  021702  100376                          BPL     .-2
 4897  021704  000757                          BR      TRYAGN
 4898  021706  005302                  AMATCH: DEC     R2
 4899  021710  010200                          MOV     R2,R0
 4900  021712  110421                          MOVB    R4,(R1)+
 4901  021714  122427  000220                  CMPB    R4,#,REM
 4902  021720  001540                          BEQ     REMPACK
 4903  021722  122427  000262                  CMPB    R4,#,FN
 4904  021726  001461                          BEQ     TRNFN
 4905  021730  122427  000211                  CMPB    R4,#,NEXT
 4906  021734  001505                          BEQ     NEXFILL
 4907  021736  122427  000257                  CMPB    R4,#,SQUOT
 4908  021742  001403                          BEQ     QUOTPAK
 4909  021744  122427  000256                  CMPB    R4,#,DQUOT
 4910  021750  001273                          BNE     TRANLUP
 4911  021752  122704  000257          QUOTPAK:CMPB    #,SQUOT,R4
 4912  021756  001402                          BEQ     .+6
 4913  021760  012704  000252                  MOV     #'"-''+,SQUOT,R4
 4914  021764  062704  177570                  ADD     #''-,SQUOT,R4
 4915  021770  112721  000377                  MOVB    #,TEXT,(R1)+
 4916  021774  020100                          CMP     R1,R0
 4917  021776  103076                          BHIS    ERRTRN
 4918  022000  121004          STOSTR: CMPB    (R0),R4         ;SAME AS INITIAL QUOTE CHAR,?
 4919  022002  001405                          BEQ     ENDQUOT
 4920  022004  121027  000015                  CMPB    (R0),#CR
 4921  022010  001415                          BEQ     ENDCR
 4922  022012  112021                          MOVB    (R0)+,(R1)+
 4923  022014  000771                          BR      STOSTR
 4924  022016  105021          ENDQUOT:CLRB    (R1)+
 4925  022020  005200                          INC     R0
 4926  022022  122427  000047                  CMPB    R4,#''
 4927  022026  001403                          BEQ     ENDSQUO
 4928  022030  112721  000256                  MOVB    #,DQUOTE,(R1)+
 4929  022034  000641                          BR      TRANLUP
 4930  022036  112721  000257          ENDSQUO:MOVB    #,SQUOTE,(R1)+
 4931  022042  000636                          BR      TRANLUP
 4932  022044  105021          ENDCR:  CLRB    (R1)+
 4933  022046  112711  000201                  MOVB    #,EOL,(R1)
 4934  022052  010102                          MOV     R1,R2
 4935  022054  124227  000377                  CMPB    -(R2),#,TEXT
 4936  022060  001375                          BNE     .-4
 4937  022062  110412                          MOVB    R4,(R2)
 4938  022064  112742  000377                  MOVB    #,TEXT,-(R2)
 4939  022070  000207                          RTS     PC
 4940  022072  122027  000040          TRNFN:  CMPB    (R0)+,#BL
 4941  022076  001775                          BEQ     .-4
 4942  022100  124027  000101                  CMPB    -(R0),#'A
 4943  022104  103411                          BLO     TRFNBAD
 4944  022106  121027  000132                  CMPB    (R0),#'Z
 4945  022112  101006                          BHI     TRFNBAD
 4946  022114  112002                          MOVB    (R0)+,R2
 4947  022116  006302                          ASL     R2
 4948  022120  162702  000200                  SUB     #'A+'A-2,R2
 4949  022124  110221                          MOVB    R2,(R1)+
 4950  022126  000604                          BR      TRANLUP
```

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 4951  022130  112740  000116          TRFNBAD:MOVB    #'N,-(R0)
 4952  022134  112740  000106                  MOVB    #'F,-(R0)
 4953  022140  005301                          DEC     R1
 4954  022142  020100                          CMP     R1,R0
 4955  022144  101013                          BHI     ERRTRN
 4956  022146  000425                          BR      REMPACK
 4957  022150  020100          NEXFILL:CMP     R1,R0
 4958  022152  103010                          BHIS    ERRTRN
 4959  022154  105021                          CLRB    (R1)+
 4960  022156  105011                          CLRB    (R1)
 4961  022160  062701  000011                  ADD     #11,R1
 4962  022164  020100                          CMP     R1,R0
 4963  022166  103002                          BHIS    ERRTRN
 4964  022170  000167  177344                  JMP     TRANLUP
 4965  022174  000167  000364          ERRTRN: JMP     ERRTR7
 4966  022200  121027  000132          NOTKWD: CMPB    (R0),#'Z
 4967  022204  101006                          BHI     REMPACK
 4968  022206  121027  000101                  CMPB    (R0),#'A
 4969  022212  103403                          BLO     REMPACK
 4970  022214  005765  000056                  TST     TI(R5)          ;2 VARS IN A ROW IS AN ERROR SO DONT
 4971  022220  001415                          BEQ     ISVAR           ;WASTE SYMBOL SPACE ON IT,
 4972  022222  112721  000377          REMPACK:MOVB    #,TEXT,(R1)+
 4973  022226  020100                          CMP     R1,R0
 4974  022230  103361                          BHIS    ERRTRN
 4975  022232  121027  000015          STOTXT: CMPB    (R0),#CR
 4976  022236  001402                          BEQ     CARRET
 4977  022240  112021                          MOVB    (R0)+,(R1)+
 4978  022242  000773                          BR      STOTXT
 4979  022244  105021          CARRET: CLRB    (R1)+
 4980  022246  112711  000201                  MOVB    #,EOL,(R1)
 4981  022252  000207                          RTS     PC
 4982  022254  112002                  ISVAR:  MOVB    (R0)+,R2
 4983  022256  122027  000040                  CMPB    (R0)+,#BL
 4984  022262  001775                          BEQ     .-4
 4985  022264  124027  000071                  CMPB    -(R0),#'9
 4986  022270  101006                          BHI     NODIGIT
 4987  022272  121027  000060                  CMPB    (R0),#'0
 4988  022276  103403                          BLO     NODIGIT
 4989  022300  000302                          SWAB    R2
 4990  022302  152002                          BISB    (R0)+,R2
 4991  022304  000302                          SWAB    R2
 4992  022306  011503          NODIGIT:MOV     (R5),R3
 4993  022310  122027  000040                  CMPB    (R0)+,#BL
 4994  022314  001775                          BEQ     .-4
 4995  022316  005300                          DEC     R0
 4996  022320  020365  000014          VARSRCH:CMP     R3,LOFREE(R5)
 4997  022324  103033                          BHIS    PUTITIN
 4998  022326  021327  177775                  CMP     (R3),#,SCALAR
 4999  022332  103003                          BHIS    NOTIT
 5000  022334  062703  000004                  ADD     #4,R3
 5001  022340  000767                          BR      VARSRCH
 5002  022342  062703  000010          NOTIT:  ADD     #10,R3
 5003
 5004                                          .IFNDF  $NOSTM
 5005  022346  026327  177770  177777          CMP     -10(R3),#,SVAR
```

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```
 5006  022354  001436                        BEQ     TRYSVAR
 5007                                        ,ENDC
 5008
 5009  022356  022302                        CMP     (R3)+,R2
 5010  022360  001357                        BNE     VARSRCH
 5011  022362  121027  000044                CMPB    (R0),#'$
 5012  022366  001754                        BEQ     VARSRCH
 5013
 5014                                        ,IFNDF  $NOSTR
 5015  022370  000406                        BR      FOUNDV
 5016  022372  022302              TRYSVAR:  CMP     (R3)+,R2
 5017  022374  001351                        BNE     VARSRCH
 5018  022376  121027  000044                CMPB    (R0),#'$
 5019  022402  001346                        BNE     VARSRCH
 5020  022404  005200                        INC     R0
 5021                                        ,ENDC
 5022
 5023  022406  162703  000012          FOUNDV: SUB     #12,R3
 5024  022412  000441                        BR      RETVAR
 5025                                  PUTITIN:
 5026                                        ,IFNDF  $NOSTR
 5027  022414  062703  000014                ADD     #14,R3
 5028  022420  020365  000072                CMP     R3,LOSTR(R5)    ;MAKE SURE STRINGS ARE NOT THERE
 5029  022424  103405                        BLO     PUTAOK
 5030  022426  004767  000526                JSR     PC,UPPACK       ;IF THEY ARE, PACK THEM UPWARDS
 5031  022432  020365  000072                CMP     R3,LOSTR(R5)    ;AND TRY AGAIN
 5032  022436  103060                        BHIS    ERROV2          ;NO GOOD
 5033  022440  005743                  PUTAOK: TST     -(R3)           ;R3 IS END OF ENTRY
 5034                                        ,ENDC
 5035
 5036                                        ,IFDF   $NOSTR
 5037                                        ADD     #12,R3          ;ADDRESS END OF ENTRY IN R3
 5038                                        ,ENDC
 5039
 5040  022442  020365  000012                CMP     R3,HIFREE(R5)
 5041  022446  101054                        BHI     ERROV2
 5042  022450  010365  000014                MOV     R3,LOFREE(R5)
 5043  022454  010243                        MOV     R2,-(R3)
 5044  022456  005043                        CLR     -(R3)
 5045  022460  005043                        CLR     -(R3)
 5046  022462  005043                        CLR     -(R3)
 5047  022464  012743  177775                MOV     #,SCALAR,-(R3)
 5048
 5049                                        ,IFNDF  $NOSTR
 5050  022470  121027  000044                CMPB    (R0),#'$
 5051  022474  001010                        BNE     RETVAR
 5052  022476  005200                        INC     R0
 5053  022500  012723  177777                MOV     #,SVAR,(R3)+
 5054  022504  005123                        COM     (R3)+
 5055  022506  005123                        COM     (R3)+
 5056  022510  005113                        COM     (R3)
 5057  022512  162703  000006                SUB     #6,R3
 5058                                        ,ENDC
 5059
 5060  022516  010565  000056          RETVAR: MOV     R5,T1(R5)       ;SOMETHING NONZERO,
```

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 5061  022522  161503                  RETLNO: SUB     (R5),R3
 5062  022524  000303                        SWAB    R3
 5063  022526  110321                        MOVB    R3,(R1)+
 5064  022530  000303                        SWAB    R3
 5065  022532  110321                        MOVB    R3,(R1)+
 5066  022534  020100                        CMP     R1,R0
 5067  022536  101216                        BHI     ERRTRN
 5068  022540  000167  177000                JMP     TRANVAR
 5069                                  ISNUM:
 5070  022544  010046                        MOV     R0,-(SP)        ;SAVE PTR IN CASE OF BAD NUM
 5071  022546  004767  000602                JSR     PC,VAL          ;FIND MANTISSA AND EXPONENT
 5072  022552  121027  000056                CMPB    (R0),#'.
 5073  022556  001016                        BNE     EXPTEN
 5074  022560  012600                        MOV     (SP)+,R0
 5075  022562  000617                        BR      REMPACK
 5076  022564  004167  174654          ERRTR7: JSR     R1,MSGERR
 5077                                        ,IFNDF  $LONGER
 5078  022570  046124     124                ,ASCII  \TLT\
 5079                                        ,ENDC
 5080                                        ,IFDF   $LONGER
 5081                                        ,ASCII  'LINE TOO LONG TO TRANSLATE'
 5082                                        ,ENDC
 5083  022573     000                        ,BYTE 0
 5084                                        ,EVEN
 5085  022574  000167  156406                JMP     READY2
 5086  022600  004167  174640          ERROV2: JSR     R1,MSGERR
 5087                                        ,IFNDF  $LONGER
 5088  022604  052120     102                ,ASCII  \PTB\
 5089                                        ,ENDC
 5090                                        ,IFDF   $LONGER
 5091                                        ,ASCII  'PROGRAM TOO BIG'
 5092                                        ,ENDC
 5093  022607     000                        ,BYTE 0
 5094                                        ,EVEN
 5095  022610  000167  156372                JMP     READY2
 5096  022614  020327  014630          EXPTEN: CMP     R3,#14630
 5097  022620  101140                        BHI     MAKFLIT
 5098  022622  005702                        TST     R2
 5099  022624  003404                        BLE     EXPNEG
 5100  022626  004767  174562                JSR     PC,MPYTEN
 5101  022632  005302                        DEC     R2
 5102  022634  000767                        BR      EXPTEN
 5103  022636  001131          EXPNEG: BNE     MAKFLIT
 5104  022640  005703                        TST     R3
 5105  022642  001127                        BNE     MAKFLIT
 5106  022644  020427  177775                CMP     R4,#,SCALAR
 5107  022650  103124                        BHIS    MAKFLIT
 5108  022652  016503  000020                MOV     LINE(R5),R3
 5109  022656  005301                        DEC     R1
 5110  022660  020103                        CMP     R1,R3
 5111  022662  103452                        BLO     MAKLNO
 5112  022664  121127  000204                CMPB    (R1),#,GOSUB
 5113  022670  001447                        BEQ     MAKLNO
 5114  022672  121127  000205                CMPB    (R1),#,GOTO
 5115  022676  001444                        BEQ     MAKLNO
```

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```
 5116  022700  121127  000224                  CMPB    (R1),#,CALL
 5117  022704  001441                          BEQ     MAKLNO
 5118  022706  121127  000242                  CMPB    (R1),#,THEN
 5119  022712  001436                          BEQ     MAKLNO
 5120  022714  121127  000300                  CMPB    (R1),#,LIST
 5121  022720  001433                          BEQ     MAKLNO
 5122  022722  005201                          INC     R1
 5123  022724  005003                          CLR     R3
 5124  022726  005704                          TST     R4
 5125  022730  002474                          BLT     MAKFLIT
 5126  022732  020427  000377                  CMP     R4,#377
 5127  022736  003003                          BGT     MAKEI2
 5128  022740  112721  000375          LITZERO:MOVB    #,ILII1,(R1)+
 5129  022744  000407                          BR      MAKEOK
 5130  022746  112721  000376          MAKEI2: MOVB    #,ILII2,(R1)+
 5131  022752  000304          LITCOMN:SWAB    R4
 5132  022754  020100                          CMP     R1,R0
 5133  022756  103010                          BHIS    TRNER4
 5134  022760  110421                          MOVB    R4,(R1)+
 5135  022762  000304                          SWAB    R4
 5136  022764  110421          MAKEOK: MOVB    R4,(R1)+
 5137  022766  005726                          TST     (SP)+
 5138  022770  020100                          CMP     R1,R0
 5139  022772  101002                          BHI     TRNER4
 5140  022774  000167  176540                  JMP     TRANLUP
 5141  023000  000167  177170          TRNER4: JMP     ERRTRN
 5142  023004  000167  177570          ERROV3: JMP     ERROV2
 5143  023010  005201          MAKLNO: INC     R1
 5144  023012  011503                          MOV     (R5),R3
 5145  023014  020365  000014          LNOSRCH:CMP     R3,LOFREE(R5)
 5146  023020  103013                          BHIS    STOLNO
 5147  023022  021327  177775                  CMP     (R3),#,SCALAR
 5148  023026  103403                          BLO     ISLNO
 5149  023030  062703  000012                  ADD     #12,R3
 5150  023034  000767                          BR      LNOSRCH
 5151  023036  021304          ISLNO:  CMP     (R3),R4
 5152  023040  001425                          BEQ     FOUNDLN
 5153  023042  062703  000004                  ADD     #4,R3
 5154  023046  000762                          BR      LNOSRCH
 5155                          STOLNO:
 5156                                  .IFDF   $NOSTK
 5157                                  ADD     #4,R3
 5158                                  .ENDC
 5159
 5160                                  .IFNDF  $NOSTK
 5161  023050  062703  000006                  ADD     #6,R3           ;CHECK THAT THE SYMTAB SPACE
 5162  023054  020365  000072                  CMP     R3,LOSTR(R5)    ;IS NOT OCCUPIED BY STRINGS
 5163  023060  103405                          BLO     STOAOK
 5164  023062  004767  000072                  JSR     PC,UPPACK       ;IF IT IS, MOVE STRINGS UP
 5165  023066  020365  000072                  CMP     R3,LOSTR(R5)    ;AND CHECK ROOM ENOUGH AGAIN
 5166  023072  103344                          BHIS    ERROV3
 5167  023074  005743          STOAOK: TST     -(R3)           ;ADJUST SYMTAB ADDRESS
 5168                                  .ENDC
 5169
 5170  023076  020365  000012                  CMP     R3,HIFREE(R5)
```

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 5171  023102  101340                          BHI     ERROV3
 5172  023104  010365  000014                  MOV     R3,LOFREE(R5)
 5173  023110  005043                          CLR     -(R3)
 5174  023112  010443                          MOV     R4,-(R3)
 5175  023114  005726          FOUNDLN:TST     (SP)+
 5176  023116  000167  177400                  JMP     RETLNO
 5177  023122  005703          MAKFLIT:        TST     R3
 5178  023124  001002                          BNE     CALNRM
 5179  023126  005704                          TST     R4
 5180  023130  001703                          BEQ     LITZERO
 5181  023132  004767  174374          CALNRM: JSR     PC,NORM
 5182  023136  112721  000374                  MOVB    #,FLII,(R1)+
 5183  023142  000303                          SWAB    R3
 5184  023144  020100                          CMP     R1,R0
 5185  023146  103314                          BHIS    TRNER4
 5186  023150  110321                          MOVB    R3,(R1)+
 5187  023152  000303                          SWAB    R3
 5188  023154  110321                          MOVB    R3,(R1)+
 5189  023156  000675                          BR      LITCOMN
 5190
 5191
```

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                                .IFNDF  $NOSTR
                        ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        ;  SUBROUTINE 'UPPACK'  CALLED BY JSR PC
                        ;                       PACKS STRING STORAGE TOWARD HIGH CORE
                        ;                       R0  UNUSED
                        ;                       R1,R2,R3  PRESERVED
                        ;                       R4  UNUSED
                        ;                       R5  MUST POINT TO USER AREA
                        ;                       SP  GOES 10 DEEPER AFTER JSR
023160  010146          UPPACK: MOV     R1,-(SP)
023162  010246                  MOV     R2,-(SP)
023164  010346                  MOV     R3,-(SP)
023166  005046                  CLR     -(SP)
023170  016501  000074          MOV     HISTR(R5),R1
023174  016502  000012          MOV     HIFREE(R5),R2
023200  010265  000074          MOV     R2,HISTR(R5)
023204  005016          UPPLOOP:CLR     (SP)            ;GET END OF THE NEXT STRING
023206  154116                  BISB    -(R1),(SP)
023210  001012                  BNE     UPPNZRO         ;(LAST BYTE CONTAINS THE LENGTH)
023212  020165  000072  UPPBAD: CMP     R1,LOSTR(R5)
023216  101372                  BHI     UPPLOOP
023220  010265  000072          MOV     R2,LOSTR(R5)
023224  005726                  TST     (SP)+
023226  012603                  MOV     (SP)+,R3
023230  012602                  MOV     (SP)+,R2
023232  012601                  MOV     (SP)+,R1
023234  000207                  RTS     PC
023236  161601          UPPNZRO:SUB     (SP),R1         ;ADDRESS BACK PTR
023240  005003                  CLR     R3
023242  154103                  BISB    -(R1),R3
023244  000303                  SWAB    R3
023246  154103                  BISB    -(R1),R3        ;GET IT IN R3
023250  000303                  SWAB    R3
023252  005301                  DEC     R1
023254  030327  000001          BIT     R3,#1           ;CHECK REL TO SYMBOLS
023260  001402                  BEQ     .+6
023262  005303                  DEC     R3
023264  061503                  ADD     (R5),R3         ;YES, ADD BASE OF SYM TAB
023266  020365  000004          CMP     R3,POL(R5)      ;MAKE SURE IT'S NOT TOO HI
023272  103347                  BHIS    UPPBAD
023274  020306                  CMP     R3,SP           ;IN STACK IS OK
023276  103013                  BHIS    UPPGOOD
023300  020365  000010          CMP     R3,ARRAYS(R5)   ;IN ARRAYS IS GOOD
023304  101342                  BHI     UPPBAD
023306  020365  000012          CMP     R3,HIFREE(R5)   ;IN FREE STORAGE IS BAD
023312  101005                  BHI     UPPGOOD
023314  020365  000014          CMP     R3,LOFREE(R5)
023320  103334                  BHIS    UPPBAD
023322  020315                  CMP     R3,(R5)
023324  103732                  BLO     UPPBAD          ;BELOW SYMBOL TABLE IS BAD
023326  062716  000004  UPPGOOD:ADD     #4,(SP)         ;GOOD STRING, MOVE IT UP
023332  021301                  CMP     (R3),R1
023334  001326                  BNE     UPPBAD          ;(DON'T GARBAGE COLLECT IT)
023336  061601                  ADD     (SP),R1
023340  160113                  SUB     R1,(R3)
```

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023342  060213                  ADD     R2,(R3)
023344  114142                  MOVB    -(R1),-(R2)
023346  005316                  DEC     (SP)
023350  003375                  BGT     .-4
023352  000717                  BR      UPPBAD
                                .ENDC
```

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                                        ;+-----------------------------------------------------------
                                        ;  SUBROUTINE 'VAL'      CALLED BY JSR R7
                                        ;                       CONVERTS AN ASCII STRING AT (R0)
                                        ;                       TO A VALUE IN R3,R4, AND
                                        ;                       AN EXPONENT IN R2
                                        ;
                                        VAL:
023354  005002                          CLR     R2              ;DEC PLACES+100000 OR TRAILING ZEROES,
023356  005003                          CLR     R3              ;HIGH ORDER OF 32 BIT INTEGER,
023360  005004                          CLR     R4              ;LOW ORDER OF 32 BIT INTEGER,
023362  122027  000040          NUDIGIT:CMPB    (R0)+,#8L
023366  001775                          BEQ     .-4
023370  124027  000060                  CMPB    -(R0),#'0
023374  103427                          BLO     NOTDIG
023376  121027  000071                  CMPB    (R0),#'9
023402  101024                          BHI     NOTDIG
023404  020327  014630                  CMP     R3,#14630       ;IF HIGH WORD GREATER THAN THIS
023410  101405                          BLOS    CANFIT          ;THEN CANT FIT ANOTHER DIGIT IN 32 BITS,
023412  005200                          INC     R0
023414  005702                          TST     R2              ;CANT FIT DIGITS IN MANTISSA, BIT ITS
023416  002761                          BLT     NUDIGIT         ;AFTER POINT SO NEEDNT COUNT THEM,
023420  005202                          INC     R2              ;CANT FIT DIGITS IN MANTISSA SO MUST
023422  000757                          BR      NUDIGIT         ;KEEP TRACK OF TRAILING ZEROES,
023424  004767  173764          CANFIT: JSR     PC,MPY10N
023430  005046                          CLR     -(SP)
023432  112016                          MOVB    (R0)+,(SP)      ;AND ADD IN THE DIGIT,
023434  162716  000060                  SUB     #'0,(SP)
023440  062604                          ADD     (SP)+,R4
023442  005503                          ADC     R3
023444  005702                          TST     R2
023446  001745                          BEQ     NUDIGIT         ;FITS IN MANTISSA,
023450  005202                          INC     R2              ;FITS IN MANTISSA BUT AFTER POINT SO
023452  000743                          BR      NUDIGIT         ;COUNT DECIMAL PLACES,
023454  122027  000056          NOTDIG: CMPB    (R0)+,#'.
023460  001024                          BNE     NOTDOT
023462  005702                          TST     R2
023464  001003                          BNE     DOTROT
023466  012702  100000                  MOV     #100000,R2      ;DOT COMES AFTER SHORT NUMBER SO GET
023472  000733                          BR      NUDIGIT         ;READY TO COUNT DECIMAL PLACES,
023474  003000          DOTROT: BGT     DOTIGNO
023476  122027  000040          DOTIGNO:CMPB    (R0)+,#8L
023502  001775                          BEQ     .-4
023504  124027  000060                  CMPB    -(R0),#'0       ;DOT COMES AFTER FULL MANTISSA WITH
023510  103405                          BLO     PASTDOT         ;TRAILING ZEROES SO IGNORE MORE DIGITS,
023512  121027  000071                  CMPB    (R0),#'9
023516  101002                          BHI     PASTDOT
023520  005200                          INC     R0
023522  000765                          BR      DOTIGNO
023524  122027  000056          PASTDOT:CMPB    (R0)+,#'.       ;DOT COMES WHILE IGNORING TRAILING
023530  001400                          BEQ     DOTBAD          ;AFTER POINT WITH FULL MANTISSA:ERROR,
                                        DOTBAD:
023532  005046          NOTDOT: CLR     -(SP)
023534  124027  000105                  CMPB    -(R0),#'E
023540  001056                          BNE     NOEXPON         ;NO 'E' AFTER THE NUMBER
023542  020165  000020                  CMP     R1,LINE(R5)     ;IF ITS THE FIRST THING ON THE LINE IT
023546  001453                          BEQ     NOEXPON         ;MUST BE A LINENO SO 'E' IS ILLEGAL,
```

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023550  005200                          INC     R0
023552  121027  000040                  CMPB    (R0),#8L
023556  001774                          BEQ     .-6
023560  122027  000053                  CMPB    (R0)+,#'+
023564  001406                          BEQ     EXPDIG
023566  124027  000055                  CMPB    -(R0),#'-
023572  001003                          BNE     EXPDIG
023574  005200                          INC     R0
023576  012716  100000                  MOV     #100000,(SP)
023602  122027  000040          EXPDIG: CMPB    (R0)+,#8L
023606  001775                          BEQ     .-4
023610  124027  000060                  CMPB    -(R0),#'0
023614  103423                          BLO     EXPDUN
023616  121027  000071                  CMPB    (R0),#'9
023622  101020                          BHI     EXPDUN
023624  011646                          MOV     (SP),-(SP)
023626  006316                          ASL     (SP)
023630  006316                          ASL     (SP)
023632  066616  000002                  ADD     2(SP),(SP)
023636  006316                          ASL     (SP)
023640  042766  077777  000002          BIC     #77777,2(SP)
023646  062616                          ADD     (SP)+,(SP)
023650  005046                          CLR     -(SP)
023652  112016                          MOVB    (R0)+,(SP)
023654  062616                          ADD     (SP)+,(SP)
023656  162716  000060                  SUB     #'0,(SP)
023662  000747                          BR      EXPDIG
023664  005716          EXPDUN: TST     (SP)
023666  002003                          BGE     NOEXPON
023670  042716  100000                  BIC     #100000,(SP)
023674  005416                          NEG     (SP)
023676  005702          NOEXPON:TST     R2
023700  002003                          BGE     EXPOK
023702  042702  100000                  BIC     #100000,R2
023706  005402                          NEG     R2
023710  062602          EXPOK:  ADD     (SP)+,R2
023712  000207                          RTS     PC
```

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                                        ;
                                        ; SYSTEM I/O BUFFERS AND HEADERS
                                        ;


                                        .IFNDF  $NOPTP
                                        ;
                                        ; PAPER TAPE READER
                                        ;
023714  023730                          PRBFHD: +       PRBUF   ;BSTRT
023716  023757                                  +       PRBEND  ;BEND
023720  023730                                  .WORD   PRBUF   ;BGET1
023722  000000                                  +       0       ;BGET2
023724  023730                                  .WORD   PRBUF   ;BPUT
023726  000000                                  .WORD   0       ;BFSPEC
                023730                  PRBUF   =.
                023760                  .       =.+$PRBSZ
                023757                  PRBEND  =.-1
                                                .EVEN
                                        ;
                                        ; PAPER TAPE PUNCH
                                        ;
023760  023774                          PPBFHD: +       PPBUF           ;BSTRT
023762  024023                                  +       PPBEND          ;BEND
023764  023774                                  .WORD   PPBUF           ;BGET1
023766  000000                                  +       0               ;BGET2
023770  023774                                  .WORD   PPBUF           ;BPUT
023772  000000                                  .WORD   0               ;BFSPEC
                023774                  PPBUF   =.
                024024                  .       =.+$PPBSZ
                024023                  PPBEND  =.-1
                                                .EVEN
                                                .ENDC


                                                .IFNDF  $NOLPI
                                        ;
                                        ; LINE PRINTER
                                        ;
024024  024040                          LPBFHD: +       LPBUF           ;BSTRT
024026  024077                                  +       LPBEND          ;BEND
024030  024040                                  .WORD   LPBUF           ;BGET1
024032  000000                                  +       0               ;BGET2
024034  024040                                  .WORD   LPBUF           ;BPUT
024036  000000                                  .WORD   0               ;BFSPEC
                024040                  LPBUF   =.
                024100                  .       =.+$LPBSZ
                024077                  LPBEND  =.-1
                                                .EVEN
                                                .ENDC
```

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                024100                  ENDAB   =.
000000'                                         .CSECT
000000'                                 BEGIN   =.
024100'                                 .       =.+ENDAB
000001                                          .END
```

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```
ADDINT  007662        ADDOVF  007702        ADDPOS  007756        ADDSTK  007622
ADDZER  007742        ADSTK1  021464        ALLEXI  010242        ALLLOO  010032
ALLNOA  010042        ALLOC   010010        ALLOC1  002452        ALLOC2  002924
ALLSTR  010164        ALOG    = ******  G   AMATCH  021706        AMPWAI  013002
ARGB    010262  G     ARRAYS  = 000010  G   ASSIGN  003270        ASSSTR  003324
ATAN    = ******  G   ATNFN   013252        BEGIN   = 000000R       BEND    = 000002
BFSPEC  = 000012      BGET1   = 000004        BGET2   = 000006        BL      = 000040
BOMB    010320        BOMBDO  010372        BOMBJM  010504        BOMBNE  010440
BOMBNX  010360        BOMBOK  010470        BPOL    011422        BPUT    = 000010
BSTRT   = 000000      BUFCLR  010510        BUFEMP  015222        BUFTP   010564
CALL    003104        CALLCK  003136        CALLM1  003146        CALLM2  003170
CALLNM  003242        CALLX   003200        CALNRM  023132        CALOG   014212
CANFIT  023424        CARRET  022244        CATCOM  013104        CATLON  013054
CATNOT  013032        CCEXIT  010700        CCMES   007325        CEXP    014224
CHKCHR  010602        CHKISE  010702        CHKOSE  010710        CLEAR   001132
CLMNLP  000402        CLMNPP  000400        CLMNTT  = 000036      CLRECH  007164
CLRFRE  011070        CLRLOO  011020        CLROK   011060        CLRSVA  011052
CLRVAR  011002        CNCFLG  = 000106      CNOFLG  = 000107      CODE    = 000016
COLONC  005312        COLUMN  = 000034  G   COMCHK  010714        COMES   007330
COMTAB  021640        CONCAT  013020        COS     = ******  G   COSFN   013230
CR      = 000015      CRLFME  007322        DEFDUN  002400        DEFGOT  002642
DELMSG  007312        DEVERR  021854        DIMDON  002674        DIMGOT  002406
DIMLOO  002326        DIMNON  002346        DIMSCL  002594        DIVLOO  011154
DIVTEN  011150        DNPACK  011206        DNPBAD  011240        DNPGOO  011352
DNPIGN  011376        DNPLOO  011232        DNPNZR  011264        DOALLO  002536
DOCHAR  016174        DOITNO  012274        DOMSG   017504        DOPUT   007014
DOTBAD  023532        DOTIGN  023476        DOTROT  023474        ECHORA  007304
ECHOSP  = 000104      EDICHG  001456        EDICON  001540        EDIGRO  001624
EDIJMP  002036        EDIMME  001330        EDIMOD  001516        EDIMOV  001550
EDIMVU  001724        EDIOVE  001476        EDIPAS  001406        EDIPUT  001302
EDIRLC  001772        EDIRLO  002030        EDIROO  001712        EDISAM  001752
EDISKI  001342        EDISRC  001346        EDIT    001226        EDITL   001250
END     003340        ENDAB   = 024100        ENDCR   022044        ENDQUO  022016
ENDSQU  022036        EOF     003340        ERADD   013214        ERCHAN  010766
EREXP   013214        ERLOG   010312        ERPD02  012646        ERPD11  013314
ERRAG1  014514        ERRARA  010254        ERRARG  010312  G     ERRDAT  006526
ERRDEE  004134        ERRDEF  002634        ERRDIM  002626        ERRDIV  013976
ERREXP  014064        ERRFN1  003232        ERRFPU  = ******  G   ERRGO   004142
ERRMIX  013012  G     ERRMX1  014242        ERRMX2  012004        ERRMX3  015526
ERRMX4  003762        ERRMX5  004222        ERRMX6  021444        ERRMX7  021330
ERRMX8  013440        ERRMX9  013310        ERRNEX  005252        ERROVR  013214
ERROV1  001662        ERROV2  022600        ERROV3  023004        ERRPDL  011772  G
ERRPD2  013202        ERRPD3  003756        ERRPD4  014236        ERRPD5  012360
ERRRET  004226        ERRRUN  002726        ERRSOV  017272        ERRSS1  015932
ERRSS2  012116        ERRSS3  016576        ERRSTR  013206        ERRSXA  014246
ERRSX1  003236        ERRSX2  005260        ERRSX3  015522        ERRSX4  011714
ERRSX5  012544        ERRSX6  004150        ERRSX7  003624        ERRSX8  006250
ERRSX9  013470        ERRSYN  012544  G     ERRTRN  022174        ERRTR7  022564
ERRTR8  006352        ERRUFN  014520        ERR4WO  004512        ERSQR   010312
ERSTAR  013214        ERSX10  004674        ERSX12  010702        EVAL    011402  G
EXECUT  002746        EXIT02  007416        EXP     = ******  G   EXPDIG  023602
EXPDUN  023664        EXPFN   013260        EXPNEG  022636        EXPOK   023710
EXPTEN  022614        FAC1    = 000040  G   FAC2    = 000042  G   FF      = 000014
FILLCH  = 000112      FILLCO  = 000110  G   FILLNO  = 000111        FIXCLZ  015030
FIXRET  015032        FIXTST  015010        FIXUP   014754        FLE     015056
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FLINE   015034        FLIT    011656        FLX     015002        FNCHK   014716
FNFN    014252        FNNEWN  014462        FNNOCO  014526        FNNUME  014750
FNOLNN  014452        FNRCOM  014700        FNREPL  014502        FNRLUP  014602
FNRSNU  014714        FNRSSC  014642        FNRSTR  014656        FNSTR   014362
FNSWAP  014276        FOR     004234        FORGO   004730        FORGOG  004726
FORGTL  004666        FORLOO  004420        FORLTL  004700        FORNEX  004920
FORNOL  004444        FORONE  004404        FORSKI  004414        FORZER  004704
FOUNDL  023114        FOUNOV  022406        FPPRES  015066        FPPSAV  015114
FRSTOU  017510        FUNCTI  013320        FUNCTJ  013332        FUNOK   013364
FUNRET  013416        GCWAIT  015350        GETBYT  015154        GETCHA  015230
GETCH1  015232        GETVAR  015364  G     GETX    015246        GET1BY  015142
GET2BY  015150        GOEXEC  006230        GONOSA  004126        GOSUR   004050
GOTECH  007222        GOTO    004050        GOTOFN  012000        GOTONE  016204
GOTOQT  011516        GOTVAL  012640        GSBCTR  = 000032      HORSTU  020750
HIFREE  = 000012      HISTR   = 000074        IDEV    = 000077        IF      003402
IFCOMP  003630        IFLEND  003536        IFLEQR  003560        IFLGTR  003772
IFLLTR  003712        IFLOOP  003506        IFNUME  003640        IFSEQ   003954
IFSGT   003766        IGNORE  002742        ILITCO  011606        ILITI   011630
ILIT2   011650        IMMED   002042        IMMSTM  002124        INITBF  015936
INITSC  015554        INPEND  006204        INPEOL  006350        INPGOO  006176
INPLOO  005736        INPNEW  005764        INPNGU  006234        INPNNU  006320
INPNUL  006342        INPOK   006112        INPPC   005732        INPRTR  005754
INPSTO  006152        INPSTR  006254        INPUT   005650        INPYES  005672
INPY01  005730        INT     015574  G     INTEXT  021132        INTFN   013444
INTRTS  015726        INT1    015664        INT1A   015676        INT1B   015714
INT2    015716        INT2A   015722        INT5    015730        INT6    015750
INT7    016010        INT8    016022        INT9    016032        IOINIT  001222
IOWAIT  016102        ISLNO   023036        ISNUM   022544        ISVAR   022254
ITAB    015360        ITABLE  010777        ITSIN   021010        JMPRRY  003376
KBCO    006774        KBWO    = 000102      KBIOUN  007000        KBINT   006722
KEYA    000476        KEYWDS  000404        LET     003256        LEVFLT  016332
LEVFNE  016374        LEVLIT  016306        LEVPLU  016304        LEVPOS  016402
LEV1LT  016350        LEV2LT  016344        LF      = 000012      LIMIT   = 000002  G
LINA    016140        LINOUN  017516        LINE    = 000020      LINEIN  016160
LINENO  = 000030      LINGET  016134        LINRUB  016104        LIST    002272
LISTSV  002262        LITCOM  022752        LITDIV  017642        LITEVA  016254
LITNOR  017552        LITOK   017600        LITSHR  017652        LITSTO  017656
LITTST  017570        LITZER  022740        LNOSRC  023014        LOCALO  016424
LOCGET  016410        LOCLOO  016524        LOCNO2  016552        LOCSS1  016462
LOFREE  = 000014      LOGFN   013274        LOSTR   = 000072      LPAR    011700
LPB     = 177516      LPBEND  = 024077        LPBFHD  024024        LPBUF   = 024040
LPERR   007546        LPINT   007510        LPOFF   007554        LPS     = 177514
LPSTRN  011720        LSTBSL  016776        LSTCHA  017002        LSTCHK  016676
LSTCRL  016744        LSTEOL  016732        LSTFLB  017110        LSTFLI  017070
LSTFN   016712        LSTILB  017062        LSTIL1  017040        LSTIL2  017052
LSTJMP  017114        LSTKWO  016664        LSTLIN  016756        LSTLNO  017152
LSTLNX  017202        LSTLOO  016610        LSTNEX  016724        LSTPC   016646
LSTPRO  016604        LSTPTR  017120        LSTSPE  017010        LSTSRC  016652
LSTTEX  017026        LSTVAR  017214        MAKCHK  017300        MAKEI2  022746
MAKEOK  022764        MAKEST  017252  G     MAKETR  017370        MAKFLI  023122
MAKGOT  017306        MAKLNO  023010        MINUS   012304        MPYTEN  017414
MSG     017452  G     MSGCOM  017454        MSGERR  017444        MSGODE  017500
MSGSUP  007200        NEXEND  005176        NEXFIL  022150        NEXGO   005214
NEXGTL  005160        NEXLTL  005170        NEXT    004752        NOCHAR  015252
NOCHR2  007502        NOCNC   002764        NODIGI  022306        NOEXPO  023076
```

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```
NOQM     006006        NOQM1    006014        NOQUOT   011522        NORM     017532 G
NORNDO   020274        NOROOM   020700        NOSUBS   015520        NOTDIG   023454
NOTDOT   023532        NOTIT    022342        NOTKWD   022200        NOTNOW   012330
NOTSYM   003062        NOWRAP   020646        NOWRP    015214        NUDIGI   023362
NUMALN   020224        NUMBIG   020206        NUMDIG   020300        NUMDIV   020214
NUMEXI   020562        NUMFIX   020002        NUMFLT   020106        NUMFM1   020362
NUMFM2   020470        NUMFM3   020504        NUMJMP   021610        NUMLP1   020400
NUMLP3   020540        NUMNEG   020030        NUMNOR   020140        NUMOK    020232
NUMOUT   017724 G      NUMPOS   020036        NUMPRS   020050        NUMSGN   017736 G
NUMSHF   020132        NUMSTT   020052        ODEV   = 000076        OFFTYP   007212
OLD      002172        OLD001   002230        OPERAN   011424        OPRATO   012166 G
OPRFN    013464        OTABLE   010774        OUT012   021034        OUT012   010760
PASTDO   023524        PC     =%000007        PDL    = 000004 G      POSIZE = 000006 G
PLUS     012430        PNDGO    021156        POP      016000        POWDWN   007562
POWLP    007574        POWUP    007572        PPB    = 177550        PPBEND = 024023
PPBFWD   023760        PPBUF  = 023774        PPERR    007474        PPINT    007436
PPS    = 177554        PRB    = 177552        PRBEND = 023757        PRBFWD   023714
PRBUF  = 023730        PREC2    012266        PREC3    012260        PREC4    012252
PREC5    012244        PREOT    007426        PRIBOT   005470        PRICM    005462
PRICOM   005512        PRIJMP   005606        PRILOO   005432        PRIMOR   005504
PRINCR   005632        PRINT    005264        PRISEM   005570        PRISTR   005414
PRITES   005600        PRNTDE   007270        PRNT01   005326        PRS    = 177550
PRS    = 000140        PR4    = 000200        PR7    = 000340        PS     = 177776
PTRINT   007336        PUSH     016046        PUSHF    012530        PUSH1    016072
PUTAOK   022440        PUTBYT   020614        PUTCCO   020734        PUTCHA   020706
PUTIT    020764        PUTITI   022414        QUNULL   012636        QUOTRU   013102
QUOTE    012552        QUOTPA   021752        READ     006396        READRA   006934
READOU   006456        READGO   006424        READOU   006522        READOT   006614
READST   006714        READY    001144        READY0   001140        READY2   001206
REAFIN   006552        REANUL   006710        REASRC   006546        REENAB   015326
REMPAC   022222        RESREG   021114        RESTOR   004036        RETLNO   022922
RETRY    021646        RETURN   004154        RETVAR   022516        REVRSE   014170
RNDCT  = 000070        RNDGOT   002600        RND1   = 000004 G      RND2   = 000006 G
RUN      002316        R0     =%000000        R0SAVE = 000044        R1     =%000001
R1SAVE = 000046        R2     =%000002        R2SAVE = 000050        R3     =%000003
R3SAVE = 000052        R4     =%000004        R4SAVE = 000054        R5     =%000005
SAVCHA   020570 G      SAVE     002234        SAVREG   021072        SAVRGI   021062
SCANPN   021134        SCRATC   001122        SETLFE   007276        SIN    = ****** G
SINFN    013222        SKIPEO   021170        SKIPHI   021234        SKIPRT   021252
SKIPTX   021244        SKIP01   021166        SKIP02   021164        SKIP05   021160
SLASH    012466        SOPRAT   012720 G      SOPRX    012776        SP     =%000006
SPARE  = 000113        SPECME   007134        SQRFN    013230        SQRT   = ****** G
SS1SAV = 000024        SS2SAV = 000026        STAR     012436        START    001102 G
STAR1    012462        STOAOK   023074        STOCOM   021316        STOLNO   023950
STOMMC   021402        STONOS   021306        STOP     003302        STOSSN   021366
STOSTR   022000        STOSVA   021334        STOSX    021442        STOTXT   022232
STOVAR   021254 G      STOVCO   021424        STOVTA   021412        STPRO    013162 G
STRGAR   012652        STRGBT   012674        STRGJM   011706        STRGVA   012660
SUBINT   021470        SUBSTK   021450        SYMBOL = 000000        S,0121   007036
S,0102   007054        TAB    = 000011        TABLE1   003010        TABLE2   012312
TABLE4   002110        TABLE5   011562 G      TABL5  = 005406        TAB1     021040
TAB2     021046        TAB3     014250        TBL1EN   003000        TBL4EN   002122
TBL5EN = 011626 G      TERMIN   012354        TKB    = 177562        TKS    = 177560 G
TPB    = 177566 G      TPCN     007240        TPCO     007254        TPHD   = 000100
TPINT    007074        TPNXT    007122        TPS    = 177564        TRAN     021512
```

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```
TRANLU   021540        TRANVA   021544        TRFNBA   022130        TRNER4   023000
TRNFN    022072        TRNPC    021642        TRYAGN   021644        TRYECH   007166
TRYKWD   021614        TRYNUM   021566        TRYSVA   022372        TSTSTK   012514
TSTS1    012520        TSTS2    012526        TYPE     007142        TYPE1    007156
T1     = 000056 G      T2     = 000060 G      T3     = 000062 G      UAASR    014072
UAJMP    014104        UANJMP   014100        UATSTA   014130        UATST0   014110
UATST2   014120        UA1      013920        UA10     013630        UA10A    013666
UA10B    013710        UA10C    013720        UA10,5   013732        UA12     013750
UA17     013760        UA17A    013772        UA17B    014010        UA17D    014020
UA17F    014040        UA19     014056        UA20     014136        UA21     014064
UA23     014146        UA4      013550        UA5      013556        UA8      013572
UA9      013616        UINTEG   012406        UMINUS   011414        UNARY    012370
UPARRO   013474        UPPACK   023160        UPPBAD   023212        UPPGOO   023326
UPPLOO   023204        UPPNER   023236        USRARE = ****** G      VAL      023354 G
VARBLE   011732        VARNOS   012156        VARSAV = 000022        VARSRC   022320
VARSS    012010        VERNUM   000040        VONESS   012122        VTWOSS   012134
WTRET    016120        XCHAR    015270        $ADR   = ****** G      $DVR   = ****** G
$ERVEC = ****** G      $IR    = ****** G      $LPBSZ = 000040        $MLR   = ****** G
$POLSH = ****** G      $PPBSZ = 000030        $PRBSZ = 000030        $PRORG = 000400
$SBR   = ****** G      $STKSZ = 000200 G      ,ABS   = 000273        ,AMPER = 000226
,ASC   = 000300        ,ATN   = 000270        ,CALL  = 000224        ,CHR$  = 000301
,CLEAR = 000313        ,COLON = 000260        ,COMMA = 000243 G      ,COS   = 000266
,DATA  = 000223        ,DEF   = 000221        ,DIM   = 000215        ,DQUOT = 000256
,EG    = 000247        ,EL    = 000245        ,EN    = 000251        ,END   = 000202
,EOF   = 000225        ,EOL   = 000201 G      ,EQ    = 000254        ,EXP   = 000271
,FLIT  = 000374        ,FN    = 000262        ,FOR   = 000203        ,GE    = 000246
,GOSUB = 000204        ,GOTO  = 000205        ,GT    = 000253        ,IF    = 000206
,ILIT1 = 000375        ,ILIT2 = 000376        ,INPUT = 000207        ,INT   = 000274
,LE    = 000244        ,LEN   = 000277        ,LET   = 000210        ,LIST  = 000306
,LOG   = 000272        ,LPAR  = 000255 G      ,LT    = 000252        ,MINUS = 000234
,NE    = 000250        ,NEXT  = 000211        ,NVAR  = 177776        ,OLD   = 000311
,PLUS  = 000232        ,POS   = 000302        ,POUND = 000261        ,PRINT = 000212
,RANDO = 000216        ,READ  = 000222        ,REM   = 000220        ,RESTO = 000217
,RETUR = 000213        ,RND   = 000264        ,RNDL  = 000263        ,RPAR  = 000237 G
,RUN   = 000307        ,SAVE  = 000310        ,SCALA = 177775        ,SCR   = 000312
,SEG   = 000303        ,SEMI  = 000236        ,SGN   = 000275        ,SIN   = 000265
,SLASH = 000231        ,SQR   = 000267        ,SQUOT = 000257        ,STAR  = 000230
,STEP  = 000241        ,STOP  = 000214        ,STR   = 000305        ,SVAR  = 177777
,TAB   = 000276        ,TERM  = 000235        ,TEXT  = 000377        ,THEN  = 000242
,TO    = 000240        ,UNARY = 000233        ,UPARR = 000227        ,VAL   = 000304
,      = 024100R
```

ERRORS DETECTED: 0

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RUN-TIME: 69 SECONDS
CORE USED: 4K

```
ADDINT    2228    2237#
ADDOVF    2240    2243#
ADDPOS    2243    2256#
ADDSTK    1559    2226#   2970    4834
ADDZER    2244    2253#
ADSTK1    4834#   4836    4839
ALLEXI    2327    2341    2348#
ALLLOO    2281#   2288
ALLNOA    2282    2285#
ALLOC      969    2273#   4027
ALLOC1     938     944#
ALLOC2     954     960#
ALLSTR    2314    2328#
ALOG        60    3183    3394
AMATCH    4887    4898#
AMPWAI    3067    3083#
ARGB        76    2369#
ARRAYS      69     311#    312    2624    2626    2697    5234
ASSIGN    1070    1100#
ASSSTR    1166    1175#
ATAN        60    3178
ATNFN     2784    3178#
BEGIN     5401#
BEND       355#   3664    4573
BFSPEC     359#   2028    2030    2139    2143    2162    2182    3689    3693    3695    3724    4621    4623    4626
BGET1      356#   3653    4576
BGET2      357#   3655    4578
BL         295#   1235    1242    1667    4171    4409    4861    4890    4893    4940    4983    4993    5263    5293
          5310    5318
BOMB       208    2400#
BOMBDO    2414    2417#
BOMBJM    2418    2438#
BOMBNE    2424    2428#
BOMBNX    2413#   2416
BOMBOK    2427    2434#
BPOL      2737    2742#
BPUT       358#   3660    4571    4580    4581
BSTRT      354#   3666    4575
BUFCLR     640     650    2019    2447#
BUFEMP    3661    3670#
BUFTP     2025    2453    2476#
CALL      1064    1077#
CALLCK    1113#   1152
CALLM1    1118#   1121
CALLM2    1127#   1130
CALLNM    1119    1128    1148#
CALLX     1126    1132#
CALNRM    5178    5181#
CALOG     3379    3394#
CANFIT    5270    5276#
CARRET    4976    4979#
CATCOM    3105    3136#
CATLON    3101    3106#
```

CATNOT 3096 3099#
CCEXIT 2498 2500 2502 2504 2507 2510 2512 2515 2517 2519#
CCMES 2093 2112#
CEXP 3382 3396#
CHKCHR 2085 2497# 3937
CHKISE 882 1765 2535#
CHKOSE 890 1602 2537#
CLEAR 643# 865
CLMNLP 364# 874 1012 1645
CLMNPP 363# 873 1011 1644
CLMNTT 322# 323 654 872 1010 1698 1843 2404 4295
CLRECH 2067 2074#
CLRFRE 2602 2624#
CLRLOO 2601# 2622
CLROK 2604 2621#
CLRSVA 2608 2616#
CLRVAR 643 888 909 2598#
CNCFLG 345# 346 692 1033 1035 2018 3900 4604
CNOFLG 346# 347 2023 4293 4609
CODE 314# 315 679 694 867 910 1014 1183 1747 1804 1944 3806 3943 4082
4856
COLONC 1604 1606#
COLUMN 73 321# 322 654 655 1605 1632 1656 1674 1698 1699 1742 2404 2405
4294 4295 4296 4298 4306 4603
COMCHK 2536 2538#
COMES 2097 2114#
COMTAB 4877 4879 4881#
CONCAT 3065 3095#
COS 60 3173
COSFN 2782 3173#
CR 294# 657 663 1186 1192 1739 1800 1852 1861 2407 2436 2506 3946 3953
4119 4854 4863 4920 4975
CRLFME 2103 2111#
DEFDUN 927# 1009
DEFGOT 921 1008#
DELMSG 2100 2109#
DEVERR 681 4622 4627 4656#
DIMDON 925 1010#
DIMGOT 919 929# 971
DIMLOO 911# 928 975 980
DIMNON 912 918#
DIMSCL 966 969#
DIVLOO 2645# 2651
DIVTEN 2644# 4346 4451
DNPACK 2665# 4020 4205
DNPBAD 2675# 2694 2698 2702 2704 2713 2719
DNPGOO 2696 2700 2705#
DNPIGN 2708 2714#
DNPLOO 2672# 2676
DNPNZR 2674 2683#
DOALLO 948 964#
DOCHAR 3931 3933# 3941 3944
DOITNO 2915 2917 2922 2937#

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DOMSG 4299# 4302
DOPUT 2020 2022 2024 2026#
DOTBAD 5302 5303#
DOTIGN 5292 5293# 5300
DOTROT 5289 5292#
ECHOBA 2088 2106#
ECHOSP 344# 345 639 2062
EDICHG 732# 739
EDICON 755#
EDIGRO 753 778#
EDIJMP 824 837#
EDIMME 688 693 700#
EDIMOD 746# 751
EDIMOV 759# 761
EDIMVU 805# 807
EDIOVE 720 740#
EDIPAS 718# 722 728
EDIPUT 706 717 742#
EDIRLC 823# 836
EDIRLO 826 832 835#
EDIROO 796 802#
EDISAM 754 777 816#
EDISKI 703# 708 714 716
EDISRC 696 699 704#
EDIT 677# 701 837 886 1189
EDITL 678 682#
END 1046 1182#
ENDAB 5399# 5402
ENDCR 4921 4932#
ENDQUO 4919 4924#
ENDSQU 4927 4930#
EOF 1065 1183#
ERADD 2229 3160#
ERCHAN 2541 2547 2550 2556#
EREXP 3158# 3181
ERLOG 2380# 3184
ERPOO2 3047# 3060 3110
ERPO11 3191#
ERR4WO 1446 1460#
ERRAG1 3422 3446 3484# 3495 3498 3500
ERRARA 2284 2286 2291 2299 2302 2304 2352#
ERRARG 70 2370 2373 2375 2381# 3196 3484
ERRDAT 1788 1893 1925#
ERRDEE 1333 1338#
ERRDEF 991# 1001 1005 1007
ERRDIM 930 935 940 942 950 956 958 963 965 968 973 982#
ERRDIV 2980 3276#
ERREXP 3254 3346#
ERRFN1 1084 1110 1114 1125 1134 1145#
ERRFPU 79 256
ERRGO 1326 1347#
ERRMIX 70 1299 1374 2862 3086# 3188 3227 3401 3771 4782 4817
ERRMX1 3401# 3429 3451

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ERRMX2 2862# 2871 2885
ERRMX3 3741 3757 3771#
ERRMX4 1211 1277 1299#
ERRMX5 1374# 1403 1413 1427
ERRMX6 4791 4817#
ERRMX7 4764 4780#
ERRMX8 3227# 3233
ERRMX9 3188#
ERRNEX 1527 1529 1538 1540 1542 1587#
ERROV1 790# 799
ERROV2 790 5032 5041 5086# 5142
ERROV3 5142# 5166 5171
ERROVR 3161# 3280
ERRPD2 3047 3144# 3191
ERRPD3 1206 1270 1296#
ERRPD4 3398# 3410 3436
ERRPD5 2952 2959# 3028
ERRPDL 70 1296 2742 2850# 2866 2959 3144 3398
ERRRET 1363 1369 1377#
ERRRUN 1017#
ERRSOV 4208# 4218
ERRSS1 3746 3748 3762 3764 3774#
ERRSS2 2876 2890 2894 2897# 2901 3774
ERRSS3 2897 4032 4036 4038 4064#
ERRSTR 3115 3147#
ERRSX1 1042 1081 1146# 1156 1162 1170 1170 1202 1204
ERRSX2 1532 1545 1596# 1609
ERRSX3 3753 3766 3768#
ERRSX4 2772 2822# 2826 2880 2892 2919
ERRSX5 885 1260 1356 1504 1596 1856 2554 2822 3079# 3022 3034 3069 3240 3404
3768 4717
ERRSX6 1288 1308 1322 1324 1356# 1360 1391 1396 1398 1409 1423 1431
ERRSX7 1252 1268# 1286 1268
ERRSX8 1767 1771 1839 1856# 1887 1922
ERRSX9 3204 3237 3240#
ERRSXA 3404# 3407 3509
ERRSYN 70 981 1146 3008#
ERRTR7 4965 5076#
ERRTR8 1805 1883#
ERRTRN 869 1883 4917 4955 4958 4963 4969# 4974 5067 5141
ERRUFN 1145 2777 3202 3412 3485#
ERSQR 2379# 3176
ERSTAR 2972 3159# 3278
ERSX10 1479 1584#
ERSX12 2539 2594#
EVAL 72 1080 1163 1199 1208 1274 1400 1410 1424 1497 1626 2369 2538 2736#
2814 2868 2882 3084 3192 3230 3414 3503 3738 3754
EXECUT 875 1016 1033# 1045 1072 1172 1178 1317 1337 1371 1511 1578 1771 1844
1923
EXIT02 2132 2134 2136 2138 2141#
EXP 68 3180 3396
EXPDIG 5313 5315 5318# 5335
EXPDUN 5321 5323 5336#

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EXPFN 2785 3188#
EXPNEG 5099 5103#
EXPOK 5341 5344#
EXPTEN 5073 5096# 5102
FAC1 73 323# 324 1272 1416 1418 1487 1488 1492 1549 1561 1582 1823 2235
2249 2250 2251 2254 2259 2260 2261 2372 2426 2431 2432 2433 2540 2873
2887 2889 2810 2875 2889 2911 2953 2961 2963 2967 2994 3222 3255 3241
3288 3302 3305 3315 3438 3580 3588 3745 3761 3816 3840 3848 3859 3875
3880 3882 3971 3987 3988 3993 3997 4146 4148 4149 4162 4167 4168 4169
4388 4391 4399 4415 4775
FAC2 73 324# 325 1271 1417 1419 1489 1490 1494 1550 1560 1583 1824 2239
2241 2246 2247 2253 2256 2257 2374 2425 2428 2429 2542 2874 2825 2811
2812 2881 2893 2900 2912 2950 2965 2968 2993 3223 3257 3259 3265 3282
3286 3306 3320 3440 3582 3747 3763 3830 3847 3857 3858 3871 3873 3876
3879 3883 3972 3989 3990 3995 4141 4142 4144 4145 4150 4151 4161 4184
4165 4393 4395 4397 4400 4413 4776
FF 293# 894
FILLCH 349# 350 2069
FILLCO 68 347# 348 2057 2059 2071
FILLNO 348# 349 2071
FIXCLE 3587 3594#
FIXRET 3581 3589 3595#
FIXTST 3579 3588#
FIXUP 2227 3577#
FLE 3604 3611#
FLINE 901 1321 3603#
FLIT 2750 2809#
FLX 3610 3613#
FNCHK 3527 3552#
FNFN 2859 3405#
FNNEWN 3461 3470#
FNNOCO 3481 3494#
FNNUME 3557 3565#
FNOLNN 3463 3467#
FNRCOM 3535 3545#
FNREPL 3441 3466 3473 3480#
FNRLUP 3512# 3553
FNRSNU 3546 3551#
FNRSSC 3528# 3538
FNRSTR 3519 3536#
FNSTR 3417 3444#
FNSWAP 3413# 3483
FOR 1047 1388#
FORGO 1502 1506 1513#
FORGOG 1499 1512#
FORGTL 1501#
FORLOO 1434 1436#
FORLTL 1500 1505#
FORNEX 1448 1469#
FORNOL 1437 1443 1445#
FORONE 1421 1432#
FORSKI 1435# 1450 1453 1459 1471 1477
FOREER 1503 1507#

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FOUNDL 5152 5175#
FOUNDV 5015 5023#
FPPRES 2234 2978 2986 3208 3252 3343 3383 3586 3593 3620#
FPPSAV 2230 2973 2981 3205 3250 3311 3320 3374 3583 3591 3632#
FRSTOU 4297 4301#
FUNCTI 3172 3174 3177 3179 3182 3185 3192#
FUNCTJ 3195 3197#
FUNOK 3207 3210# 3395 3397
FUNRET 3212 3219#
GCWAIT 3711 3713#
GET1BY 2158 2177 3653# 3687
GET2BY 2077 2080 3655#
GETBYT 3654 3656#
GETCHI 3687# 3715
GETCHA 3686# 3933
GETVAR 72 1108 1775 1891 3731#
GETX 3691# 3697 3707
GOEXEC 1842 1844#
GONOSA 1328 1336#
GOSUB 1048 1320#
GOTECH 2078 2085#
GOTO 1049 1254 1256 1258 1290 1292 1294 1310 1312 1314 1321#
GOTOFN 2758 2859#
GOTONE 3934 3936#
GOTOQT 2762 2765#
GOTVAL 3043# 3058
GSBCTR 320# 321 731 745 1329 1335 1361 1365 2029
HORSTU 4608 4611#
HIFREE 312# 313 788 2300 2308 2336 2348 2626 2699 4245 5040 5170 5206 5236
HISTR 337# 340 2303 2628 2675 2677 4219 4241 5205 5207
IDEV 341# 700 1760 1841 2581 3705 3709 3923
IF 1050 1199#
IFCOMP 1230 1236 1243 1261#
IFLEND 1232 1240#
IFLEQR 1248# 1282
IFLGTR 1283 1304#
IFLLTR 1264 1284#
IFLOOP 1229# 1234
IFNUME 1200 1265#
IFSEQ 1239 1241 1246#
IFSGT 1261 1302#
IGNORE 1032# 1057 1058 1060 1061 1063 1144 1259 1295 1315 1517 1586
IL1T1 2746 2803#
IL1T2 2748 2807#
IL1TCO 2808 2811#
IMMED 702 847#
IMMSTM 856 866#
INITBF 2457 2459 2463 3787#
INITSC 642 879 3806#
INPEND 1838# 1875
INPEOL 1769 1882#
INPGOO 1833 1836#
INPLOO 1770# 1837

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INPNEW 1779# 1819 1855
INPNGU 1828 1835 1845#
INPNNU 1872# 1879
INPNUL 1868 1878#
INPOK 1778 1815#
INPPC 1769#
INPRTR 1776# 1814
INPSTO 1826 1829#
INPSTR 1794 1859#
INPUT 1051 1747#
INPY01 1762 1768# 1877
INPYES 1748 1759#
INT 74 2371 2874 2888 3238 3744 3760 3816#
INT1 3836# 3839
INT1A 3835 3840#
INT1B 3843 3846#
INT2 3841 3847#
INT2A 3848# 3872 3874
INT5 3827 3851# 3856
INT6 3852 3857#
INT7 3822 3869#
INT8 3870 3873#
INT9 3845 3875#
INTEXT 4681 4698#
INTFN 2788 3230#
INTRTS 3817 3824 3849# 3860 3862 3868 3877
IOINIT 666#
IOWAIT 3714 3899# 4618
ISLNO 5148 5151#
ISNUM 4873 5069#
ISVAR 4971 4982#
ITAB 3706 3710 3712 3718#
ITABLE 2535 2581#
ITSIN 4617 4623#
JMPRDY 1184 1196#
KBCO 2017 2021#
KBHD 343# 344 2011 2075 2447 3959
KBIDUN 2015 2027 2038#
KBINT 234 2009#
KEYA 516# 4880
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LIMIT 69 308# 309 1332 2633
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LINENO 319# 328 871 916 1071 1433 1587 2417 2423 4713
LINGET 677 1786 3922#
LINRUB 3930# 3949
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LISTSV 892 896# 902 904
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LOCGET 2910 3050 4011# 4770 4795
LOCLOO 4043# 4048
LOCNO2 4034 4052#
LOCSS1 4014 4031#
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LOSTR 336# 337 795 798 2627 2669 2671 5028 5031 5162 5165 5211 5213
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LSTKWD 4100# 4103
LSTLIN 4115 4122#
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MAKGOT 4204 4207 4219#
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NOROOM 4577 4579 4585#
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OLD001 884 886#
OPERAN 2739 2743# 2756 2956
OPRATO 74 2806 2813 2821 2913# 2964 2969 2969 2971 2979 3239 3261 3344 3384
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OUT010 4610 4628#
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1954 1976 1987 2019 2025 2026 2031 2040 2073 2077 2080 2083 2137 2140
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1892 1918 1924 1934 2198 2402 2630 2693 3478 5230
PDSIZE 69 310# 311 849 1013
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POWLP 2196# 2200
POWUP 2192 2195#
PPB 285# 2160
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PPBFWD 2155 2456 4636 5370#
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PPERR 2157 2162#
PPINT 241 2153#
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PREC4 2928 2931#
PREC5 2929#
PREOT 2129 2143#
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PRICM 1611 1666#
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PRIMOR 1669 1672#
PRINCR 1634 1658 1670 1679 1738#
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PS 296# 3656 4568
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PUSH1 3328 3339 3865 3885#
PUSHF 2975 2983 2993# 3206
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PUTIT 4613 4616# 4620
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QUOTBU 3041 3135#
QUOTE 2765 3021#
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746 748 749 778 779 781 782 783 810 811 813 814 816 820

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	1983	2013	2014	2016	2021	2030	2060	2066	2069	2072	2091	2095	2176	2130
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	2503	2506	2509	2511	2514	2516	2535	2537	2544	2548	2549	2551	2602	2601
	2603	2607	2611	2612	2616	2619	2620	2621	2623	2624	2630	2631	2632	2633
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	3122	3124	3128	3129	3132	3135	3137	3138	3140	3216	3218	3222	3276	3288
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	4234	4235	4241	4242	4243	4244	4245	4289	4292	4299	4384	4387	4471	4489
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	4479	4488	4490	4493	4497	4499	4502	4505	4508	4511	4512	4515	4517	4520
	4521	4533	4535	4547	4580	4686	4690	4767	4792	4802	4803	4806	4807	4810
	4812	4813	4815	4856	4857	4861	4863	4867	4869	4871	4876	4878	4883	4899
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	5320	5322	5332											
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	811	817	823	825	827	829	833	850	852	866	883	893	902	903
	910	911	914	917	926	929	932	934	937	939	941	944	945	947
	949	951	953	955	957	960	961	962	970	972	974	979	1000	1002
	1006	1008	1014	1015	1017	1037	1067	1135	1143	1155	1158	1161	1169	1175
	1183	1185	1191	1201	1203	1207	1248	1265	1267	1273	1284	1304	1323	1327
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	1802	1806	1807	1809	1812	1836	1838	1845	1874	1886	1889	1919	1921	1952
	1953	1955	1956	2011	2028	2030	2079	2079	2127	2139	2143	2155	2162	2174
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	858	859	891	903	911	913	914	915	916	917	918	920	922	924
	929	931	932	933	964	967	1002	1003	1004	1008	1237	1039	1240	1241
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	808	809	936	941	943	945	1085	1117	1120	1123	1124	1129	1148	1214

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	1944	1945	1947	1948	1950	1953	1955	1960	1961	1963	1964	1966	1968	1972
	1977	1978	1980	1981	1983	2085	2220	2236	2242	2252	2255	2262	2275	2293
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READOU	1924#	1951												
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SKIPHI 4734 4744#
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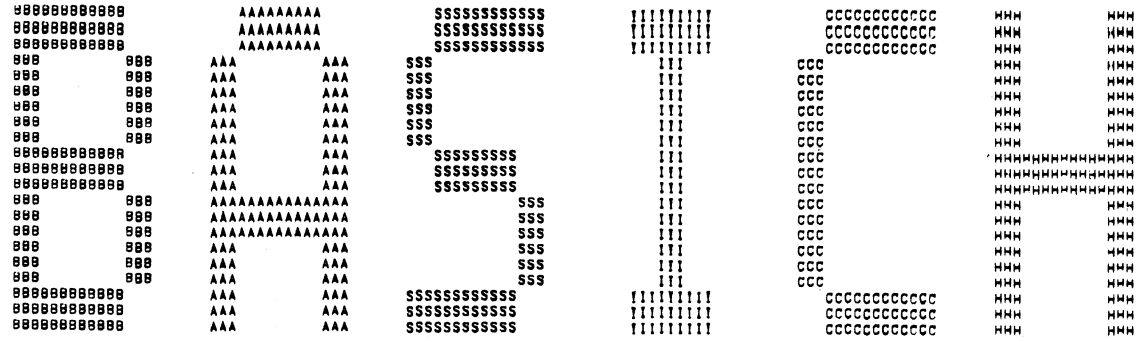

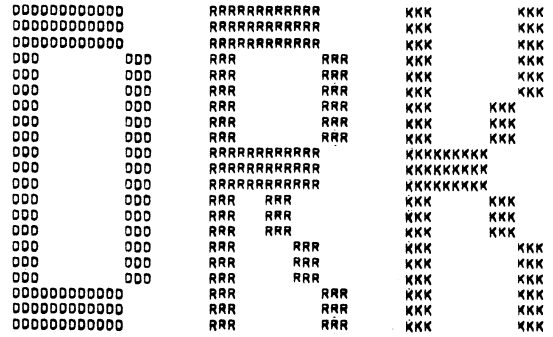

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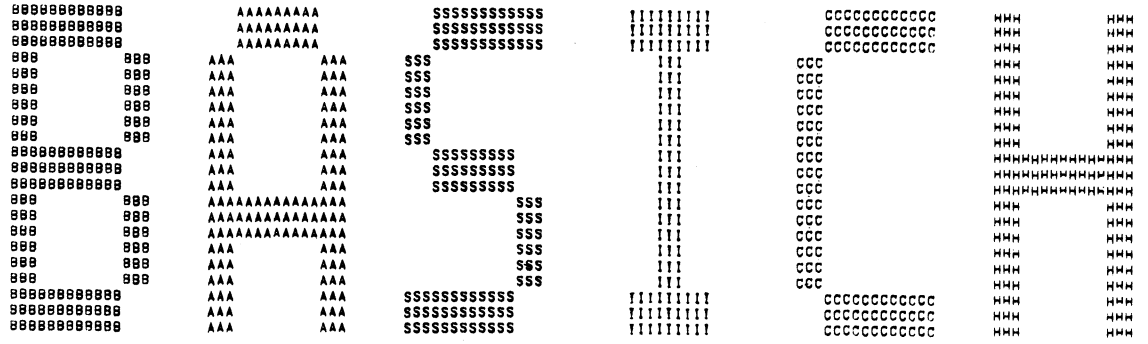

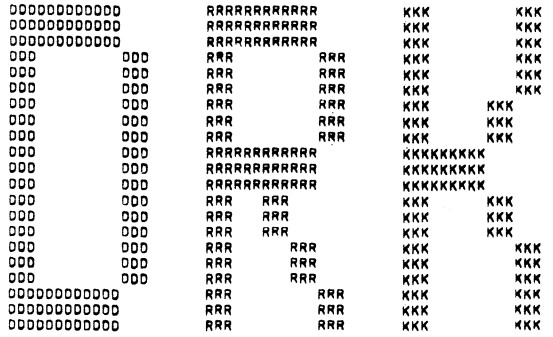

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QUEUE Switches:  /PRINT:ARROW /FILE:ASCII /COPIES:2 /SPACING:1 /LIMIT:1746
File will be RENAMEd to <057> protection
```

321

```
BASICH  MACX11   V021   22-MAR-73   15:45   PAGE 1

                        ;
                        ; BASIC/PTS  PART3-BASICH
                        ;
                        ; DEC-11-LPTBA-A-LA3
                        ;
                        ; COPYRIGHT 1973
                        ;
                        ; DIGITAL EQUIPMENT CORPORATION
                        ; MAYNARD, MASSACHUSETTS 01754
                        ;
```

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```
BASICH  MACX11   V021   22-MAR-73   15:45   PAGE 2

                            .TITLE  BASICH V001A EDIT #020 (REF) 01/31/73
                        ;                               BASIC SOURCE FILE #15
                        ;
                        ;
                        ;
                        ;
                        ;
                        ;  USER AREA AND ONCE-ONLY INIT. CODE,
                        ;
                        ;  TO BE LINKED LAST AFTER BASICL AND PDP-11 TO FORM BASIC.
                        ;
                        ;
                        ;
                        ;
                        ;
                        ;
                        ;
```

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```
                                ;
                                ; GLOBALS
                                ;
                                        .GLOBL  TPB, TKS
                                        .GLOBL  START, FILLCO
                                        .GLOBL  USRAREA
                                        .GLOBL  LIMIT, PDL, ARRAYS, PDSIZE
                                        .GLOBL  TABLE9, TBL9END
                                        .GLOBL  COLUMN, FAC1, FAC2, .RPAR
                                        .GLOBL  ERRMIX, ERRPDL, ERRSYN, ERRARG
                                        .GLOBL  EVAL, INT, MAKEST, OPRATO, SOPRAT
                                        .GLOBL  .COMMA, T1, T2, T3
                                        .GLOBL  ARGB, SAVCHAR, NUMSGN, STPRO
                                        .GLOBL  NORM, VAL
                                        .GLOBL  RND1, RND2
                                        .GLOBL  $STKS# ,IFPMP
                                ;
                                ; ASSEMBLY PARAMETERS
                                ;
                                        .IFNDF  STPBS#  ;TELEPRINTER BUFFER SIZE
000020                  STPBSZ  =20             ;CHARACTERS
                                        .ENDC
                                ;
                                        .IFNDF  SKBBS#  ;KEYBOARD BUFF. SIZE
000020                  SKBBSZ  =20             ;CHARACTERS
                                        .ENDC
                                ;
                                        .IFNDF  SULNSP  ;USER LINE SPACE
000120                  SULNSP  =120            ;BYTES
                                        .ENDC
```

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```
                        000000  
                                        .CSECT
000000                  R0      =%0
000001                  R1      =%1
000002                  R2      =%2
000003                  R3      =%3
000004                  R4      =%4
000005                  R5      =%5
000006                  SP      =%6
000007                  PC      =%7
000040                  BL      =40

000000' 000000          USRAREA:.WORD   0
                        BASICH:
                        ;RND FUNCTION -- GENERATE RANDOM NUMBER
                        ;       SCAN PAST ARG IF PRESENT
000002' 004737  000000G RNDLFN: JSR     PC,@#EVAL
000006' 103452                  BCS     ERRNDA
000010' 122127  000000G         CMPB    (R1)+,#.RPAR
000014' 001045                  BNE     ERRNDS
                        RNDFN:
000016' 010500          RNDFN2: MOV     R5,R0
000020' 062700  000000G         ADD     #RND2,R0
000024' 011003                  MOV     @R0,R3
000026' 014002                  MOV     -(R0),R2
000030' 006303                  ASL     R3              ;MULT BY 2
000032' 006102                  ROL     R2
000034' 062002                  ADD     (R0)+,R2        ;NOW BY 3
000036' 061003                  ADD     @R0,R3
000040' 005502                  ADC     R2
000042' 061002                  ADD     @R0,R2          ;NOW BY 2**16+3
000044' 100002                  BPL     RPLUS
000046' 062702  100000          ADD     #100000,R2      ;GET 2**32+G
000052' 010310          RPLUS:  MOV     R3,@R0          ;STORE NEW GENERATORS
000054' 010240                  MOV     R2,-(R0)
000056' 012700  000201          MOV     #201,R0         ;INITIAL EXPONENT
000062' 006303          RNORM:  ASL     R3              ;FLOAT RESULT
000064' 006102                  ROL     R2
000066' 103402                  BCS     REXP            ;JUMP WHEN LEADING BIT FOUND
000070' 005300                  DEC     R0              ;ADJUST EXPONENT FOR SHIFT
000072' 000773                  BR      RNORM
000074' 105003          REXP:   CLRB    R3
000076' 150203                  BISB    R2,R3
000100' 000303                  SWAB    R3
000102' 105002                  CLRB    R2
000104' 150002                  BISB    R0,R2           ;INSERT EXPONENT INTO RESULT
000106' 000302                  SWAB    R2
000110' 006002                  ROR     R2
000112' 006003                  ROR     R3              ;INSERT + SIGN
000114' 010265  000000G         MOV     R2,FAC1(R5)
000120' 010365  000000G         MOV     R3,FAC2(R5)
000124' 000137  000000G         JMP     @#OPRATOR
000130' 000137  000000G ERRNDS: JMP     @#ERRSYN
000134' 000137  000000G ERRNDA: JMP     @#ERRARG
                        RNDFNE:
```

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```
                                        ;ABS FUNCTION ROUTINE
000140' 004737 000000G          ABSFN:  JSR     PC,@#EVAL
000144' 103438                          BCS     ERABSA
000146' 122127 000000G                  CMPB    (R1)+,#,RPAR
000152' 001027                          BNE     ERABSS
000154' 005765 000000G                  TST     FAC1(R5)
000160' 001435                          BEQ     ABSINT
000162' 100017                          BPL     ABSX
000164' 042765 100000 000000G           BIC     #100000,FAC1(R5)
000172' 000413                          BR      ABSX
000174' 005765 000000G          ABSINT: TST     FAC2(R5)
000200' 100010                          BPL     ABSX
000202' 005465 000000G                  NEG     FAC2(R5)
000206' 102005                          BVC     ABSX
000210' 012765 044000 000000G           MOV     #44000,FAC1(R5)
000216' 005065 000000G                  CLR     FAC2(R5)
000222' 000137 000000G          ABSX:   JMP     @#OPRATOR
000226' 000137 000000G          ERABSA: JMP     @#ERRARG
000232' 000137 000000G          ERABSS: JMP     @#ERRSYN
                                ABSFNE:
```



```
                                        ;SGN FUNCTION ROUTINE
000236' 004737 000000G          SGNFN:  JSR     PC,@#EVAL
000242' 103424                          BCS     ERSGNA
000244' 122127 000000G                  CMPB    (R1)+,#,RPAR
000250' 001023                          BNE     ERSGNS
000252' 005000                          CLR     R0
000254' 005765 000000G                  TST     FAC1(R5)
000260' 001003                          BNE     SGNFLT
000262' 005765 000000G                  TST     FAC2(R5)
000266' 001410                          BEQ     SGNX
000270' 100002                  SGNFLT: BPL     SGNPOS
000272' 005300                          DEC     R0
000274' 000401                          BR      .+4
000276' 005200                  SGNPOS: INC     R0
000300' 010065 000000G                  MOV     R0,FAC2(R5)
000304' 005065 000000G                  CLR     FAC1(R5)
000310' 000137 000000G          SGNX:   JMP     @#OPRATOR
000314' 000137 000000G          ERSGNA: JMP     @#ERRARG
000320' 000137 000000G          ERSGNS: JMP     @#ERRSYN
                                SGNFNE:
```

```
                                        ;TAB FUNCTION ROUTINE
000324' 004737 000000G          TABFN:  JSR     PC,@#ARGB
000330' 122127 000000G                  CMPB    (R1)+,#,RPAR
000334' 001036                          BNE     ERTABS
000336' 005046                          CLR     -(SP)
000340' 116516 000000G                  MOVB    FAC2(R5),(SP)
000344' 021627 000110           TABB:   CMP     (SP),#72.
000350' 103403                          BLO     TABC
000352' 162716 000110                   SUB     #72.,(SP)
000356' 000772                          BR      TABB
000360' 167516 000000G          TABC:   SUB     @COLUMN(R5),(SP)
000364' 100001                          BPL     .+4
000366' 005016                          CLR     (SP)
000370' 001002                          BNE     TABNON
000372' 005316                          DEC     (SP)
000374' 000414                          BR      TABNULL
000376' 010502                  TABNON: MOV     R5,R2
000400' 004737 000000G                  JSR     PC,@#MAKESTR
000404' 011600                          MOV     (SP),R0
000406' 005002                          CLR     R2
000410' 151002                          BISB    (R0),R2
000412' 062700 000003                   ADD     #3,R0
000416' 112720 000040                   MOVB    #BL,(R0)+
000422' 005302                          DEC     R2
000424' 003374                          BGT     .-6
000426' 000137 000000G          TABNULL:JMP     @#SOPRATR
000432' 000137 000000G          ERTABS: JMP     @#ERRSYN
                                TABFNE:
```

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```
                                        ; LEN FUNCTION ROUTINE
000436' 004737 000000G          LENFN:  JSR     PC,@#EVAL
000442' 103016                          BCC     ERLENA
000444' 122127 000000G                  CMPB    (R1)+,#,RPAR
000450' 001015                          BNE     ERLENS
000452' 005065 000000G                  CLR     FAC1(R5)
000456' 005065 000000G                  CLR     FAC2(R5)
000462' 012602                          MOV     (SP)+,R2
000464' 005202                          INC     R2
000466' 001402                          BEQ     .+6
000470' 114265 000000G                  MOVB    -(R2),FAC2(R5)
000474' 000137 000000G                  JMP     @#OPRATOR
000500' 000137 000000G          ERLENA: JMP     @#ERRARG
000504' 000137 000000G          ERLENS: JMP     @#ERRSYN
                                LENFNE:
```

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```
                                        ; ASC FUNCTION ROUTINE
000510' 004737 000000G          ASCFN:  JSR     PC,@#EVAL
000514' 103023                          BCC     ERASCA
000516' 122127 000000G                  CMPB    (R1)+,#,RPAR
000522' 001022                          BNE     ERASCS
000524' 012602                          MOV     (SP)+,R2
000526' 020227 177777                   CMP     R2,#177777
000532' 001414                          BEQ     ERASCA
000534' 121227 000001                   CMPB    (R2),#1
000540' 001011                          BNE     ERASCA
000542' 005065 000000G                  CLR     FAC1(R5)
000546' 005065 000000G                  CLR     FAC2(R5)
000552' 116265 000003 000000G           MOVB    3(R2),FAC2(R5)
000560' 000137 000000G                  JMP     @#OPRATOR
000564' 000137 000000G          ERASCA: JMP     @#ERRARG
000570' 000137 000000G          ERASCS: JMP     @#ERRSYN
                                ASCFNE:
                                        ; CHR$ FUNCTION ROUTINE
000574' 004737 000000G          CHRSFN: JSR     PC,@#ARGB
000600' 122127 000000G                  CMPB    (R1)+,#,RPAR
000604' 001016                          BNE     ERCHRS
000606' 142765 000200 000000G           BICB    #200,FAC2(R5)   ;TAKE CHAR MOD 128
000614' 012746 000001                   MOV     #1,-(SP)
000620' 010502                          MOV     R5,R2
000622' 004737 000000G                  JSR     PC,@#MAKESTR
000626' 011600                          MOV     (SP),R0
000630' 116560 000000G 000003           MOVB    FAC2(R5),3(R0)
000636' 000137 000000G                  JMP     @#SOPRATR
000642' 000137 000000G          ERCHRS: JMP     @#ERRSYN
                                CHRFNE:
```

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```
                                        ; POS FUNCTION ROUTINE
000646' 004737 000000G          POSFN:  JSR     PC,@#EVAL
000652' 103133                          BCC     ERPOSA
000654' 122127 000000G                  CMPB    (R1)+,#,COMMA
000660' 001132                          BNE     ERPOSS
000662' 004737 000000G                  JSR     PC,@#EVAL
000666' 103125                          BCC     ERPOSA
000670' 122127 000000G                  CMPB    (R1)+,#,COMMA
000674' 001124                          BNE     ERPOSS
000676' 004737 000000G                  JSR     PC,@#EVAL
000702' 103517                          BCS     ERPOSA
000704' 004737 000000G                  JSR     PC,@#INT
000710' 122127 000000G                  CMPB    (R1)+,#,RPAR
000714' 001114                          BNE     ERPOSS
000716' 005000                          CLR     R0
000720' 005765 000000G                  TST     FAC1(R5)
000724' 001077                          BNE     POSF
000726' 005765 000000G                  TST     FAC2(R5)
000732' 003474                          BLE     POSF
000734' 156500 000000G                  BISB    FAC2(R5),R0     ;R0 IS N
                                ;CHECK NULL XS
000740' 026627 000002 177777            CMP     2(SP),#177777
000746' 001002                          BNE     POSX
000750' 005000                          CLR     R0
000752' 000464                          BR      POSF
                                ;COMPUTE LENGTH OF XS
000754' 005002                  POSX:   CLR     R2
000756' 157602 000002                   BISB    @2(SP),R2
                                ;CHECK NULL YS
000762' 021627 177777                   CMP     (SP),#177777
000766' 001004                          BNE     POSY
                                ;NULL YS, ANS IS MIN(N,LEN(XS))
000770' 020002                          CMP     R0,R2
000772' 003454                          BLE     POSF
000774' 010200                          MOV     R2,R0
000776' 000452                          BR      POSF
                                ;SAVE ADDR OF END OF YS IN T2
001000' 005003                  POSY:   CLR     R3
001002' 157603 000000                   BISB    @(SP),R3
001006' 061603                          ADD     (SP),R3
001010' 062703 000003                   ADD     #3,R3
001014' 010365 000000G                  MOV     R3,T2(R5)
001020' 012603                          MOV     (SP)+,R3
001022' 062703 000003                   ADD     #3,R3
                                ;SAVE ADDR OF END OF XS IN T1
001026' 061602                          ADD     (SP),R2
001030' 062702 000003                   ADD     #3,R2
001034' 010265 000000G                  MOV     R2,T1(R5)
001040' 012602                          MOV     (SP)+,R2
001042' 060002                          ADD     R0,R2
001044' 062702 000002                   ADD     #2,R2
                                ;FIND MATCHING FIRST CHARACTER
001050' 121322                  POSFST: CMPB    (R3),(R2)+
001052' 001406                          BEQ     POSREM
001054' 005200                  POSTRY: INC     R0
```

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```
  298  001056' 020265  000000G                CMP     R2,T1(R5)
  299  001062' 001372                          BNE     POSFST
  300  001064' 005000                          CLR     R0
  301  001066' 000417                          BR      POSF2
  302                                  ;CHECK THAT REMAINING CHARS MATCH
  303  001070' 010246                  POSREM: MOV     R2,-(SP)
  304  001072' 010346                          MOV     R3,-(SP)
  305  001074' 005203                          INC     R3
  306  001076' 020365  000000G        POSNXT: CMP     R3,T2(R5)
  307  001102' 001410                          BEQ     POSF
  308  001104' 020265  000000G                CMP     R2,T1(R5)
  309  001110' 001402                          BEQ     POSNO
  310  001112' 122223                          CMPB    (R2)+,(R3)+
  311  001114' 001770                          BEQ     POSNXT
  312  001116' 012603                  POSNO:  MOV     (SP)+,R3
  313  001120' 012602                          MOV     (SP)+,R2
  314  001122' 000754                          BR      POSTRY
  315                                  ;RETURN FROM FUNCTION
  316  001124' 022626                  POSF:   CMP     (SP)+,(SP)+
  317  001126' 010065  000000G        POSF2:  MOV     R0,FAC2(R5)
  318  001132' 005065  000000G                CLR     FAC1(R5)
  319  001136' 000137  000000G                JMP     @#OPRATOR
  320  001142' 000137  000000G        ERPOSA: JMP     @#ERRARG
  321  001146' 000137  000000G        ERPOSS: JMP     @#ERRSYN
  322                                  POSFNE:
  323
  324
```

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```
  325                                  ; SEG FUNCTION ROUTINE
  326  001152' 004737  000000G        SEGFN:  JSR     PC,@#EVAL
  327  001156' 103114                          BCC     ERSEGA
  328  001160' 122127  000000G                CMPB    (R1)+,#,COMMA
  329  001164' 001113                          BNE     ERSEGS
  330  001166' 004737  000000G                JSR     PC,@#EVAL
  331  001172' 103506                          BCS     ERSEGA
  332  001174' 004737  000000G                JSR     PC,@#INT
  333  001200' 016546  000000G                MOV     FAC1(R5),-(SP)
  334  001204' 016546  000000G                MOV     FAC2(R5),-(SP)
  335  001210' 122127  000000G                CMPB    (R1)+,#,COMMA
  336  001214' 001077                          BNE     ERSEGS
  337  001216' 004737  000000G                JSR     PC,@#EVAL
  338  001222' 103472                          BCS     ERSEGA
  339  001224' 004737  000000G                JSR     PC,@#INT
  340  001230' 122127  000000G                CMPB    (R1)+,#,RPAR
  341  001234' 001067                          BNE     ERSEGS
  342                                  ;GET X VALUE IN R2
  343  001236' 012602                          MOV     (SP)+,R2
  344  001240' 012600                          MOV     (SP)+,R0
  345  001242' 100403                          BMI     SEGX0
  346  001244' 001055                          BNE     SEGNUL
  347  001246' 005702                          TST     R2
  348  001250' 003002                          BGT     SEGL
  349  001252' 012702  000001          SEGX0:  MOV     #1,R2
  350                                  ;COMPUTE LENGTH OF A$ IN R0
  351  001256' 005000                  SEGL:   CLR     R0
  352  001260' 021627  177777                  CMP     (SP),#177777    ;CHECK NULL STRING
  353  001264' 157600  000000                  BISB    @(SP),R0
  354                                  ;GET Y VALUE IN R3
  355  001270' 005765  000000G        SEGTY:  TST     FAC1(R5)
  356  001274' 100441                          BMI     SEGNUL
  357  001276' 001402                          BEQ     SEGTY2
  358  001300' 010003                          MOV     R0,R3
  359  001302' 000403                          BR      SEGRNG
  360  001304' 016503  000000G        SEGTY2: MOV     FAC2(R5),R3
  361  001310' 003433                          BLE     SEGNUL
  362                                  ;CHECK 0<=R2<=R3<=R0
  363  001312' 020003                  SEGRNG: CMP     R0,R3
  364  001314' 101001                          BHI     SEGR2
  365  001316' 010003                          MOV     R0,R3
  366  001320' 020203                  SEGR2:  CMP     R2,R3
  367  001322' 101026                          BHI     SEGNUL
  368                                  ;COMPUTE LENGTH OF OUTPUT STRING
  369  001324' 160203                          SUB     R2,R3
  370  001326' 005203                          INC     R3
  371                                  ;MAKE NEW STRING OF THE CORRECT LENGTH
  372  001330' 010246                          MOV     R2,-(SP)        ;SAVE START CHAR
  373  001332' 010502                          MOV     R5,R2
  374  001334' 010346                          MOV     R3,-(SP)
  375  001336' 004737  000000G                JSR     PC,@#MAKESTR
  376                                  ;FIX STACK AND MOVE IN CHARS FROM OLD STRING
  377  001342' 012602                          MOV     (SP)+,R2        ;NEW STRING POINTER
  378  001344' 012600                          MOV     (SP)+,R0        ;START CHAR
  379  001346' 061600                          ADD     (SP),R0         ;ADD OLD STR POINTER
```

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```
  380  001350' 010216                          MOV     R2,(SP)         ;SAVE NEW STRING
  381  001352' 005003                          CLR     R3
  382  001354' 151203                          BISB    (R2),R3         ;R3 IS NEW STRING LENGTH
  383  001356' 062702  000003                  ADD     #3,R2           ;ADDR FIRST CHAR IN NEW STR
  384  001362' 062700  000002                  ADD     #2,R0           ;ADDR START CHAR IN OLD STR
  385  001366' 112022                  SEGLP:  MOVB    (R0)+,(R2)+     ;FILL IN NEW STRING
  386  001370' 005303                          DEC     R3
  387  001372' 001375                          BNE     SEGLP
  388  001374' 000137  000000G                 JMP     @#STPRO
  389                                  ;OUTPUT NULL STRING
  390  001400' 012716  177777          SEGNUL: MOV     #177777,(SP)
  391  001404' 000137  000000G         SEGX:   JMP     @#SOPRATR
  392  001410' 000137  000000G         ERSEGA: JMP     @#ERRARG
  393  001414' 000137  000000G         ERSEGS: JMP     @#ERRSYN
  394                                  SEGFNE:
  395
  396
```

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```
  397                                  ; VAL FUNCTION ROUTINE
  398  001420' 004737  000000G         VALFN:  JSR     PC,@#EVAL
  399  001424' 103056                          BCC     ERVALA
  400  001426' 122127  000000G                 CMPB    (R1)+,#,RPAR
  401  001432' 001051                          BNE     ERVALS
  402                                  ;READ STRING
  403  001434' 011600                          MOV     (SP),R0
  404  001436' 020027  177777                  CMP     R0,#177777      ;CHECK NULL STRING
  405  001442' 001006                          BNE     VALR
  406  001444' 005065  000000G                 CLR     FAC1(R5)
  407  001450' 005065  000000G                 CLR     FAC2(R5)
  408  001454' 005726                          TST     (SP)+
  409  001456' 000435                          BR      VALJ
  410  001460' 005002                  VALR:   CLR     R2
  411  001462' 151002                          BISB    (R0),R2
  412  001464' 010216                          MOV     R2,(SP)
  413  001466' 062700  000003                  ADD     #3,R0
  414  001472' 060002                          ADD     R0,R2
  415  001474' 105012                          CLRB    (R2)
  416  001476' 010446                          MOV     R4,-(SP)
  417  001500' 010146                          MOV     R1,-(SP)
  418  001502' 010246                          MOV     R2,-(SP)
  419                                  ;READ ASCII NUMBER AND EXPONENT
  420  001504' 004737  000000G                 JSR     PC,@#VAL
  421                                  ;NORMALIZE TO FORM FLT PT NUMBER
  422  001510' 004737  000000G                 JSR     PC,@#NORM
  423  001514' 010365  000000G                 MOV     R3,FAC1(R5)
  424  001520' 010465  000000G                 MOV     R4,FAC2(R5)
  425                                  ;CHECK END OF STRING
  426  001524' 105710                  VALCE:  TSTB    (R0)
  427  001526' 001403                          BEQ     VALX
  428  001530' 122027  000040                  CMPB    (R0)+,#BL
  429  001534' 001773                          BEQ     VALCE
  430                                  ;RESTORE REGS AND RETURN TO EVAL
  431  001536' 020026                  VALX:   CMP     R0,(SP)+
  432  001540' 001010                          BNE     ERVALA
  433  001542' 012601                          MOV     (SP)+,R1
  434  001544' 012604                          MOV     (SP)+,R4
  435  001546' 012602                          MOV     (SP)+,R2
  436  001550' 110210                          MOVB    R2,(R0)         ;RESTORE STRING LENGTH
  437  001552' 000137  000000G         VALJ:   JMP     @#OPRATOR
  438  001556' 000137  000000G         ERVALS: JMP     @#ERRSYN
  439  001562' 000137  000000G         ERVALA: JMP     @#ERRARG
  440                                  VALFNE:
  441
  442
```

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```
                                        ; STR FUNCTION ROUTINE
001566' 004737 000000G          STRFN:  JSR     PC,@#EVAL
001572' 103432                          BCS     ERSTRA
001574' 122127 000000G                  CMPB    (R1)+,#,RPAR
001600' 001031                          BNE     ERSTRS
001602' 012746 000020                   MOV     #20,-(SP)
001606' 010502                          MOV     R5,R2
001610' 004737 0000000G                 JSR     PC,@#MAKESTR
001614' 011603                          MOV     (SP),R3
001616' 062703 000003                   ADD     #3,R3
001622' 010365 000000G                  MOV     R3,T2(R5)
001626' 005065 000000G                  CLR     T1(R5)
001632' 004737 000000G                  JSR     PC,@#NUMSGN
001636' 000000G                         .WORD   SAVCHAR
001640' 010602                          MOV     SP,R2
001642' 016546 000000G                  MOV     T1(R5),-(SP)
001646' 004737 0000000G                 JSR     PC,@#MAKESTR
001652' 012616                          MOV     (SP)+,(SP)
001654' 000137 000000G                  JMP     @#STPRO         ;PROTECT STRING

001660' 000137 000000G          ERSTRA: JMP     @#ERRARG
001664' 000137 000000G          ERSTRS: JMP     @#ERRSYN
                                STRFNE:
                                FNEND:
```



```
                                        ;
                                        ;
                                        ; USER AREA STORAGE CELLS
                                        ;
001670' 000000                  USR:    .WORD   0               ;SYMBOLS
001672' 000000                          .WORD   0               ;LIMIT
001674' 000000                          .WORD   0               ;PDL
001676' 000000                          .WORD   0               ;PDSIZE
001700' 000000                          .WORD   0               ;ARRAYS
001702' 000000                          .WORD   0               ;HIFREE
001704' 000000                          .WORD   0               ;LOFREE
001706' 002214'                         .WORD   USRCODE         ;CODE
001710' 002074'                         .WORD   USRLINE         ;LINE
001712' 000000                          .WORD   0               ;VARSAV
001714' 000000                          .WORD   0               ;SS1SAV
001716' 000000                          .WORD   0               ;SS2SAV
001720' 000000                          .WORD   0               ;LINENO
001722' 000000                          .WORD   0               ;GSBCTR
001724' 000000                          .WORD   0               ;COLUMN
001726' 000000                          .WORD   0               ;CLMNTTY
001730' 000000                          .WORD   0               ;FAC1
001732' 000000                          .WORD   0               ;FAC2
001734' 000000                          .WORD   0               ;R0SAVE
001736' 000000                          .WORD   0               ;R1SAVE
001740' 000000                          .WORD   0               ;R2SAVE
001742' 000000                          .WORD   0               ;R3SAVE
001744' 000000                          .WORD   0               ;R4SAVE
001746' 000000                          .WORD   0               ;T1
001750' 000000                          .WORD   0               ;T2
001752' 000000                          .WORD   0               ;T3
001754' 000000                          .WORD   0               ;RND1
001756' 000000                          .WORD   0               ;RND2
001760' 000000                  RAND:   .WORD   0               ;RNDCT
001762' 000000                          .WORD   0               ;LOSTR
001764' 000000                          .WORD   0               ;HISTR
001766'     000                         .BYTE   0               ;ODEV
001767'     000                         .BYTE   0               ;IDEV
001770' 002040'                         .       TPBFWI          ;TPWD
001772' 002004'                         .       KBBFWI          ;KBWD
001774' 000000                          .WORD   0               ;ECHOSP
001776'     000                         .BYTE   0               ;CNCFLG
001777'     000                         .BYTE   0               ;CNOFLG
002000'     000                         .BYTE   0               ;FILLCO
002001'     000                         .BYTE   0               ;FILLNO
002002'     000                         .BYTE   0               ;FILLCH
002003'     000                         .BYTE   0               ; [SPARE BYTE]
```

```
                                        ;
                                        ; USER I/O BUFFER AND BUFFER HDR, SPACE (TTY)
                                        ;
002004' 002020'                 KBBFH1: .       KBBUF1          ;BSTRT
002006' 002037'                         .       KBBEN1          ;BEND
002010' 002020'                         .WORD   KBBUF1          ;BGET1
002012' 002020'                         .WORD   KBBUF1          ;BGET2
002014' 002020'                         .WORD   KBBUF1          ;BPUT
002016' 000000                          .       0               ;BFSPEC
        002020'                 KBBUF1: .,
                                .       .+$KBBSZ                ;DEFAULT SIZE = 20 CHARS,
        002037'                 KBBEN1: .=.+1
                                        .EVEN
                                        ;
002040' 002054'                 TPBFH1: .       TPBUF1          ;BSTRT
002042' 002073'                         .       TPBEN1          ;BEND
002044' 000000                          .       0               ;BGET1 (NOT USED)
002046' 002054'                         .WORD   TPBUF1          ;BGET2
002050' 002054'                         .WORD   TPBUF1          ;BPUT
002052' 000000                          .       0               ;BFSPEC
        002054'                 TPBUF1: .,
                                .       .+$TPBSZ                ;DEFAULT = 20 CHARS,
        002073'                 TPBEN1: .=.+1
                                        .EVEN
                                USRLINE:
        002214'                 .=.+$ULNSP                      ;DEFAULT = 120
                                USRCODE:
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                                        ;
                                        ; --ONCE-ONLY INIT, CODE
                                        ;    FIND OUT HOW MUCH CORE AND EXPAND USRAREA ACCORDINGLY
                                        ;
002214' 162704  017776          DECCORE:SUB     #17770,R4       ;COME HERE ON TRAP FOR BAD MEM,
002220' 022626                          CMP     (SP)+,(SP)+     ;  REF, AND DEC, CORE SIZE
002222' 000412                          BR      TRYCORE
                                        ;
002224' 000005                  ONCE.ONLY:RESET
002226' 012706  003304'                 MOV     #TMPSTK,SP      ;TEMP, STACK
002232' 004767  000000G                 JSR     PC,IFPMP        ;INIT FOR FPMP ROUTINES
002236' 012737  002214' 000004          MOV     #DECCORE,@#4    ;SET UP TRAP ADDR,
002244' 012704  160000                  MOV     #160000,R4      ;28K
002250' 005744                  TRYCORE:TST     -(R4)           ;TRAPS TO DECCORE IF BAD ADDR
002252' 012737  000000  000004          MOV     #0,@#4          ;FALLS THRU IF OK = RESTORE TRAP ADDR,
002260' 010467  001100                  MOV     R4,HICORE
                                        ;
                                        ;INITIALIZE TOP OF BASIC
002264' 012701  000002'                 MOV     #BASIC,R1
                                        ;PRINT HEADING AND READ ANSWER
002270' 004367  000756          INIHD:  JSR     R3,PRMSG
002274'    015     012                  .BYTE   15,12
002276' 040502  044523  020103          .ASCII  'BASIC V001A'
        002304' 030126  030460     101
002311'    015     012                  .BYTE   15,12
002313'    117  052120  043040          .ASCII  'OPT FNS: A=ALL, N=NONE, I=IND'
        002320' 051516  020072  026501
        002326' 046101  026114  047040
        002334' 047055  047117  026105
        002342' 044440  044455  042116
002350'    015     012                  .BYTE   15,12
002352'    077                          .ASCII  '?'
002353'    000                          .BYTE   0
                                        .EVEN
002354' 004767  000722                  JSR     PC,RDANS
002360' 120027  000116                  CMPB    R0,#'N          ;CHECK FOR N
002364' 001512                          BEQ     INISAV
002366' 005002                          CLR     R2              ;CLEAR ALL FLAG
002370' 120027  000101                  CMPB    R0,#'A          ;CHECK FOR A
002374' 001002                          BNE     INITI
002376' 005202                          INC     R2              ;SET ALL FLAG
002400' 000415                          BR      INIALL
002402' 120027  000111          INITI:  CMPB    R0,#'I          ;CHECK FOR I
002406' 001330                          BNE     INIHD
                                        ;PRINT HEADING FOR INDIV FUNCTIONS
002410' 004367  000636                  JSR     R3,PRMSG
002414'    015     012     012          .BYTE   15,12,12
002417'    040  026531  042531          .ASCII  ' Y=YES  N=NO'
        002424' 020123  047040  047055
        002432'    117
002433'    000                          .BYTE   0
002434' 012705  003374'         INIALL: MOV     #FNTAB,R5
002440' 012704  000000G                 MOV     #TABLE5,R4
                                        ;GET NEXT FUNCTION TABLE ADDRESS
002444' 011503                  INILP:  MOV     (R5),R3
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  593  002446' 100005                      BPL     INIFN
  594  002450' 062705  000002              ADD     #2,R5           ;SKIP A FUNCTION
  595  002454' 062704  000002              ADD     #2,R4
  596  002460' 000771                      BR      INILP
  597                                ;PRINT QUESTION FOR FUNCTION, GET ANSWER
  598  002462' 020427  000000G     INIFN: CMP     R4,#TBL3END
  599  002466' 101051                      BHI     INISAV
  600  002470' 020527  003544'             CMP     R5,#FNTABE
  601  002474' 103046                      BHIS    INISAV
  602  002476' 005722                      TST     R2
  603  002500' 001027                      BNE     INIDF
  604  002502' 016567  000004  000014      MOV     4(R5),FNNAM1
  605  002510' 016567  000006  000010      MOV     6(R5),FNNAM2
  606  002516' 004367  000530              JSR     R3,PRMSG
  607  002522'    015     012              ,BYTE   15,12
  608  002524' 000000              FNNAM1: ,WORD   0
  609  002526' 000000              FNNAM2: ,WORD   0
  610  002530' 035040     040              ,ASCII  ' ? '
  611  002533'    000                      ,BYTE   0
  612                                     ,EVEN
  613  002534' 004767  000542              JSR     PC,RDANS
  614  002540' 120027  000116              CMPB    R0,#'N          ;CHECK FOR N
  615  002544' 001002                      BNE     INITY
  616  002546' 005724                      TST     (R4)+
  617  002550' 000413                      BR      ININXT
  618  002552' 120027  000131      INITY: CMPB    R0,#'Y          ;CHECK FOR Y
  619  002556' 001341                      BNE     INIFN
  620                                ;DEFINE THE FUNCTION
  621  002560' 010100              INIDF: MOV     R1,R0
  622  002562' 162700  000000G             SUB     #TABLE5,R0
  623  002566' 010024                      MOV     R0,(R4)+        ;PLACE ADDRESS IN TABLE
  624  002570' 012321              INIMV: MOV     (R3)+,(R1)+
  625  002572' 020365  000002              CMP     R3,2(R5)
  626  002576' 103774                      BLO     INIMV
  627  002600' 062705  000010      ININXT: ADD     #10,R5
  628  002604' 020427  000000G             CMP     R4,#TBL3END
  629  002610' 101715                      BLOS    INILP
  630
  631                                ;SAVE TOP OF BASIC
  632  002612' 010167  175162      INISAV: MOV     R1,USRAREA
  633                                ;MOVE USER AREA TO TOP OF BASIC
  634  002616' 012702  001670'             MOV     #USR,R2
  635  002622' 010203                      MOV     R2,R3           ;COMPUTE RELOCATION CONSTANT
  636  002624' 160103                      SUB     R1,R3
  637  002626' 020227  002214'     MOVLP: CMP     R2,#USRCODE
  638  002632' 103005                      BHIS    MOVDON
  639  002634' 012221                      MOV     (R2)+,(R1)+
  640  002636' 001773                      BEQ     MOVLP
  641  002640' 160341                      SUB     R3,-(R1)        ;RELOCATE NON-ZERO ENTRIES
  642  002642' 005721                      TST     (R1)+
  643  002644' 000770                      BR      MOVLP
  644                                MOVDON:
  645
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  646
  647                                ;INITIALIZE USER AREA
  648  002646' 016704  000512              MOV     HICORE,R4       ;R4 IS HIGHEST ADDR, IN CORE
  649  002652' 162704  000300              SUB     #300,R4
  650  002656' 016705  175116              MOV     USRAREA,R5
  651  002662' 010465  000000G             MOV     R4,LIMIT(R5)
  652  002666' 162704  000134              SUB     #134,R4         ;POINTER SPACE
  653  002672' 010465  000000G             MOV     R4,POL(R5)      ;BASE OF STACK
  654  002676' 162704  000000G             SUB     #$STKSZ,R4      ;MAX. STACK SIZE
  655  002702' 010465  000000G             MOV     R4,ARRAYS(R5)   ;HIEST ARRAY STOR. LOC.
  656  002706' 062704  000040              ADD     #40,R4
  657  002712' 010465  000000G             MOV     R4,POSIZE(R5)
  658  002716' 012765  032331  000000G     MOV     #32331,RND1(R5)
  659  002724' 012765  163251  000000G     MOV     #163251,RND2(R5)
  660
  661                                ;DIALOGUE TO SET UP TERMINAL TYPE
  662  002732' 005003              ASKSER: CLR     R3
  663  002734' 004367  000312              JSR     R3,PRMSG
  664  002740'    015     012     012      ,BYTE   15,12,12
  665  002743'    106  051501  020124      ,ASCII  'FAST SER TERM?'
       002750' 042523  020122  042524
       002756' 046522     077
  666  002761'    000                      ,BYTE   0
  667                                     ,EVEN
  668  002762' 004767  000314              JSR     PC,RDANS
  669  002766' 120027  000116              CMPB    R0,#'N
  670  002772' 001457                      BEQ     ASKDON
  671  002774' 120027  000131              CMPB    R0,#'Y
  672  003000' 001354                      BNE     ASKSER
  673  003002' 005203                      INC     R3
  674
  675  003004' 004367  000242      ASKLA1: JSR     R3,PRMSG
  676  003010'    015     012              ,BYTE   15,12
  677  003012' 040514  030063  024040      ,ASCII  'LA30 (300 BAUD)?'
       003020' 030063  020060  040502
       003026' 042125  037451
  678  003032'    000                      ,BYTE   0
  679         003034'                      ,EVEN
  680  003034' 004767  000242              JSR     PC,RDANS
  681  003040' 120027  000131              CMPB    R0,#'Y
  682  003044' 001432                      BEQ     ASKDON
  683  003046' 120027  000116              CMPB    R0,#'N
  684  003052' 001354                      BNE     ASKLA
  685  003054' 005203                      INC     R3
  686
  687  003056' 004367  000170      ASKVT1: JSR     R3,PRMSG
  688  003062'    015     012              ,BYTE   15,12
  689  003064' 052126  032460  024040      ,ASCII  'VT05 (>=600 BAUD)?'
       003072' 036476  030066  020060
       003100' 040502  042125  037451
  690  003106'    000                      ,BYTE   0
  691         003110'                      ,EVEN
  692  003110' 004767  000166              JSR     PC,RDANS
  693  003114' 120027  000131              CMPB    R0,#'Y
  694  003120' 001404                      BEQ     ASKDON
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695  003122' 120027 000116                  CMPB    R0,#'N
696  003126' 001353                         BNE     ASKYT
697  003130' 000700                         BR      ASKSEK
698
699  003132' 010302                 ASKDON: MOV     R3,R2
700  003134' 001412                         BEQ     FILLDON
701  003136' 006303                         ASL     R3
702  003140' 060302                         ADD     R3,R2
703  003142' 062702 003363'                 ADD     #FILLTB,R2
704  003146' 010503                         MOV     R5,R3
705  003150' 062703 000000G                 ADD     #FILLCO,R3
706  003154' 112223                         MOVB    (R2)+,(R3)+
707  003156' 112223                         MOVB    (R2)+,(R3)+
708  003160' 112223                         MOVB    (R2)+,(R3)+
709                                 FILLDON:
710                                 ;PRINT OUT IF USER FUNCTIONS LOADED
711  003162' 005737 000046                  TST     @#46
712  003166' 001414                         BEQ     NOUSR
713  003170' 004367 000056                  JSR     R3,PRMSG
714  003174'    015    012    012           ,BYTE   15,12,12
715  003177'    125 042523 020122           ,ASCII  'USER FNS LOADED'
     003204' 047106 020123 047514
     003212' 042101 042105
716  003216'    000                        ,BYTE 0
717         003220'                        ,EVEN
718                                 NOUSR:
719  003220' 004367 000026                  JSR     R3,PRMSG
720  003224'    015    012    012           ,BYTE   15,12,12,0
     003227'    000
721                                         ,EVEN
722
723                                 ;CHECK IF RNDL LOADED
724  003230' 012702 000000G                 MOV     #TABLE5,R2
725  003234' 012203                         MOV     (R2)+,R3
726  003236' 001403                         BEQ     NORND
727  003240' 062703 000014                  ADD     #RNDFN-RNDLFN,R3
728  003244' 010312                         MOV     R3,(R2)         ;DEFINE RND ALSO
729                                 NORND:
730  003246' 000167 0000000                 JMP     START
731
732
733  003252' 010300                 PRMSG:  MOV     R3,R0
734  003254' 105737 1777760         PRLP:   TSTB    @#TPB-2
735  003260' 100375                         BPL     PRLP
736  003262' 112037 000000G                 MOVB    (R0)+,@#TPB
737  003266' 001372                         BNE     PRLP
738  003270' 010003                         MOV     R0,R3
739  003272' 005203                         INC     R3
740  003274' 006203                         ASR     R3
741  003276' 006303                         ASL     R3
742  003300' 000203                         RTS     R3
743
744                                 ;SUBROUTINE TO READ ANSWER FROM TELETYPE
745  003302' 005267 176452          RDANS:  INC     RAND
746  003306' 105737 0000000                 TSTB    @#TKS
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747  003312' 100373                         BPL     RDANS
748  003314' 113700 000002G                 MOVB    @#TKS+2,R0
749  003320' 042700 177600                  BIC     #177600,R0
750  003324' 010067 000004                  MOV     R0,INCH
751  003330' 004367 177716                  JSR     R3,PRMSG
752  003334' 000000                 INCH:   ,WORD   0
753  003336' 016700 177772                  MOV     INCH,R0
754  003342' 000207                         RTS     PC
755         003364'                         .       =.+20
756                                 TMPSTK:
757  003364' 000000                 HICORE: ,WORD   0
758
759         003363'                 FILLTB=.-3
760  003366'    000     011     015         ,BYTE   0,11.,15        ;LA37
761  003371'    000     004     012         ,BYTE   0,04,12         ;VT05
762
763                                 FNTAB:
764  003374' 000002'                        ,WORD   RNDLFN
765  003376' 000140'                        ,WORD   RNDFNE
766  003400' 047122 020104                  ,ASCII  'RND '
767  003404' 177777                         ,WORD   -1              ; RND
768  003406' 177777                         ,WORD   -1              ; SIN
769  003410' 177777                         ,WORD   -1              ; COS
770  003412' 177777                         ,WORD   -1              ; SQR
771  003414' 177777                         ,WORD   -1              ; ATN
772  003416' 177777                         ,WORD   -1              ; EXP
773  003420' 177777                         ,WORD   -1              ; LOG
774  003422' 000140'                        ,WORD   ABSFN           ; ABS
775  003424' 000236'                        ,WORD   ABSFNE
776  003426' 041101 020123                  ,ASCII  'ABS '
777  003432' 177777                         ,WORD   -1              ; INT
778  003434' 000236'                        ,WORD   SGNFN           ; SGN
779  003436' 000324'                        ,WORD   SGNFNE
780  003440' 043523 020116                  ,ASCII  'SGN '
781  003444' 000324'                        ,WORD   TABFN           ; TAB
782  003446' 000436'                        ,WORD   TABFNE
783  003450' 040524 020102                  ,ASCII  'TAB '
784  003454' 000436'                        ,WORD   LENFN           ; LEN
785  003456' 000510'                        ,WORD   LENFNE
786  003460' 042514 020116                  ,ASCII  'LEN '
787  003464' 000510'                        ,WORD   ASCFN           ; ASC
788  003466' 000574'                        ,WORD   ASCFNE
789  003470' 051501 020103                  ,ASCII  'ASC '
790  003474' 000574'                        ,WORD   CHRSFN          ; CHR$
791  003476' 000646'                        ,WORD   CHRFNE
792  003500' 044103 022122                  ,ASCII  'CHR$'
793  003504' 000646'                        ,WORD   POSFN           ; POS
794  003506' 001152'                        ,WORD   POSFNE
795  003510' 047520 020123                  ,ASCII  'POS '
796  003514' 001152'                        ,WORD   SEGFN           ; SEG
797  003516' 001420'                        ,WORD   SEGFNE
798  003520' 042523 022107                  ,ASCII  'SEG$'
799  003524' 001420'                        ,WORD   VALFN           ; VAL
800  003526' 001566'                        ,WORD   VALFNE
801  003530' 040526 020114                  ,ASCII  'VAL '
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003534' 001566'                    ,WORD   STRFN           ; STR
003536' 001670'                    ,WORD   STRFNE
003540' 052123  022122             ,ASCII  /STRS/
                              FNTABE::
                                    ,END    ONCEONL
                 002224'
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ABSFN    000140R    ABSFNE   000236R    ABSINT   000174R    ABSX     000222R
ARGB   = ****** G   ARRAYS = ****** G   ASCFN    000510R    ASCFNE   000574R
ASKDON   003132R    ASKLA    003004R    ASKSER   002732R    ASKVT    003056R
BASICH   000002R    BL     = 000040     CHRFNE   000646R    CHRSFN   000574R
COLUMN = ****** G   DECCOR   002214R    ERABSA   000226R    ERABSS   000232R
ERASCA   000564R    ERASCS   000570R    ERCHRS   000642R    ERLENA   000500R
ERLENS   000504R    ERPOSA   001142R    ERPOSS   001146R    ERRARG = ****** G
ERRMIX = ****** G   ERRNDA   000134R    ERRNDS   000130R    ERRPDL = ****** G
ERRSYN = ****** G   ERSEGA   001410R    ERSEGS   001414R    ERSGNA   000314R
ERSGNS   000320R    ERSTRA   001660R    ERSTRS   001664R    ERTABS   000432R
ERVALA   001562R    ERVALS   001556R    EVAL   = ****** G   FAC1   = ****** G
FAC2   = ****** G   FILLCO = ****** G   FILLDO   003102R    FILLTB = 003363R
FNEND    001670R    FNNAM1   002524R    FNNAM2   002526R    FNTAB    003374R
FNTABE   003544R    HICORE   003364R    IFPMP  = ****** G   INCH     003334R
INIALL   002434R    INIDF    002560R    INIFN    002462R    INIHD    002270R
INILP    002444R    INIMV    002570R    ININXT   002600R    INISAV   002612R
INITI    002402R    INITY    002552R    INT    = ****** G   KBBEN1 = 002037R
KBBFH1   002004R    KBBUF1 = 002020R    LENFN    000436R    LENFNE   000510R
LIMIT  = ****** G   MAKEST = ****** G   MOVDON   002646R    MOVLP    002626R
NORM   = ****** G   NORND    003246R    NOUSR    003220R    NUMSGN = ****** G
ONCEON   002224R    OPRATO = ****** G   PC     =%000007    POL    = ****** G
POSIZE = ****** G   POSF     001124R    POSFN    000646R    POSFNE   001152R
POSFST   001050R    POSF2    001126R    POSNO    001116R    POSNXT   001076R
POSREM   001070R    POSTRY   001054R    POSX     000754R    POSY     001000R
PRLP     003254R    PRMSG    003252R    RAND     001700R    RDANS    003302R
REXP     000074R    RNDFN    000616R    RNDFNE   000140R    RNDFN2   000616R
RNDLFN   000002R    RND1   = ****** G   RND2   = ****** G   RNDRM    000062R
RPLUS    000052R    R0     =%000000     R1     =%000001    R2     =%000002
R3     =%000003     R4     =%000004     R5     =%000005    SAVCHA = ****** G
SEGFN    001152R    SEGFNE   001420R    SEGL     001256R    SEGLP    001366R
SEGNUL   001400R    SEGRNG   001312R    SEGR2    001320R    SEGTY    001270R
SEGTY2   001304R    SEGX     001404R    SEGX0    001252R    SGNFLT   000270R
SGNFN    000236R    SGNFNE   000324R    SGNPOS   000276R    SGNX     000310R
SOPRAT = ****** G   SP     =%000006     START  = ****** G   STPRO  = ****** G
STRFN    001566R    STRFNE   001670R    TAB0     000344R    TABC     000360R
TABFN    000324R    TABFNE   000436R    TABLE5 = ****** G   TARNON   000376R
TABNUL   000426R    TBL5EN = ****** G   TKS    = ****** G   TMPSTC   003364R
TPB    = ****** G   TPBEN1 = 002073R    TPBFH1   002040R    TPBUF1 = 002054R
TRYCOR   002250R    T1     = ****** G   T2     = ****** G   T3     = ****** G
USR      001670R    USRARG   000000RG   USRCOD   002214R    USRLIN   002074R
VAL    = ****** G   VALCE    001524R    VALFN    001420R    VALFNE   001566R
VALJ     001552R    VALR     001460R    VALX     001536R    %KBBSZ = 000020
%STKSZ = ****** G   %TPBSZ = 000020     %ULNSP = 000120     ,COMMA = ****** G
,RPAR  = ****** G   .      = 003544R
```

ERRORS DETECTED: 0

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RUN-TIME: 10 SECONDS
CORE USED: 3K

ABSFN 120# 774
ABSFNE 138# 775
ABSINT 125 129#
ABSX 126 128 130 132 135#
ARGB 41 164 229
ARRAYS 35 655
ASCFN 211# 787
ASCFNE 226# 788
ASKDON 670 682 694 699#
ASKLA 675# 684
ASKSER 662# 672 697
ASKVT 687# 696
BASICH 76# 563
BL 73# 185 428
CHRFNE 240# 791
CHRSFN 229# 790
COLUMN 37 173
DECCOR 549# 556
ERABSA 121 136#
ERABSS 123 137#
ERASCA 212 217 219 224#
ERASCS 214 225#
ERCHRS 231 239#
ERLENA 195 205#
ERLENS 197 206#
ERPOSA 245 249 253 320#
ERPOSS 247 251 256 321#
ERRARG 38 116 136 158 205 224 320 392 439 463
ERRMIX 38
ERRNDA 80 116#
ERRNDS 82 115#
ERRPDL 38
ERRSYN 38 115 137 159 189 206 225 239 321 393 438 464
ERSEGA 327 331 338 392#
ERSEGS 329 336 341 393#
ERSGNA 143 158#
ERSGNS 145 159#
ERSTRA 445 463#
ERSTRS 447 464#
ERTABS 166 189#
ERVALA 399 432 439#
ERVALS 401 438#
EVAL 39 79 120 142 194 211 244 248 252 326 330 337 398 444
FAC1 37 112 124 127 133 147 150 198 220 258 318 333 395 476
423
FAC2 37 113 129 131 134 149 155 168 199 203 221 222 232 237
260 262 317 334 360 407 424
FILLCO 33 705
FILLDO 700 709#
FILLTB 703 759#
FNEND 466#
FNNAM1 604 608#
FNNAM2 605 609#

FNTAB 589 763#
FNTABE 600 825#
HICORE 560 648 757#
IFPMP 44 555
INCH 750 752# 753
INIALL 581 589#
INIDF 603 621#
INIFN 593 598# 619
INIMD 565# 583
INILP 592# 596 629
INIMV 624# 626
ININXT 617 627#
INISAV 576 599 601 632#
INITI 579 582#
INITY 615 618#
INT 39 254 332 339
KBBEN1 521 528#
KBBFH1 508 520#
KBBUF1 520 522 523 524 526#
LENFN 194# 784
LENFNE 207# 785
LIMIT 35 651
MAKEST 39 180 235 375 450 459
MOVDON 638 644#
MOVLP 637# 640 643
NORM 42 422
NORND 726 729#
NOUSR 712 718#
NUMSGN 41 455
ONCEON 553# 807
OPRATO 39 114 135 157 204 223 319 437
PC 72# 79 120 142 164 180 194 211 229 235 244 248 252 254
326 330 332 337 339 375 398 420 422 444 450 455 459 595
574 613 668 680 692 754
PDL 35 653
PDSIZE 35 657
POSF 259 261 267 276 278 307 310#
POSF2 301 317#
POSFN 244# 793
POSFNE 322# 794
POSFST 295# 299
POSNO 309 312#
POSNXT 306# 311
POSREM 296 303#
POSTRY 297# 314
POSX 265 269#
POSY 273 288#
PRLP 734# 735 737
PRMSG 565 585 606 663 675 687 713 719 733# 751
R0 65# 84 85 86 87 90 91 93 96 97 98 102 178 146
152 154 155 181 183 184 189 236 237 257 262 266 275 277
292 297 300 317 344 351 353 358 363 365 378 379 384 385
403 404 411 413 414 426 428 431 436 575 578 582 614 618

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621 622 623 669 671 681 685 693 695 733 736 738 748 749
750 753
R1 66# 81 122 144 165 196 213 230 246 290 255 328 335 340
400 417 433 446 563 621 624 632 636 639 641 642
R2 67# 87 89 90 92 93 95 97 100 105 107 108 129 110
112 179 182 183 186 200 201 203 215 216 218 222 234 269
270 275 277 288 289 290 291 292 293 295 298 303 308 310
313 343 347 349 366 369 372 373 377 380 382 383 385 410
411 412 414 415 418 435 436 449 457 577 580 602 634 635
637 639 699 702 703 706 707 708 724 725 728
R3 68# 86 88 91 96 99 104 105 106 111 113 280 281 282
283 284 285 286 295 304 309 306 310 312 358 360 363 365
366 369 370 374 381 382 386 423 451 452 453 565 585 592
606 624 625 635 636 641 662 663 673 675 685 687 699 701
702 704 705 706 707 708 713 719 725 727 728 733 738 739
740 741 742 751
R4 69# 416 424 434 549 557 558 560 590 595 598 616 623 628
648 649 651 652 653 654 655 656 657
R5 70# 84 112 113 124 127 129 131 133 134 147 149 155 156
168 173 179 198 199 203 220 221 222 232 234 237 258 260
262 284 290 298 306 308 317 318 333 334 355 360 373 406
407 423 424 449 453 454 458 589 592 594 600 604 605 625
627 650 651 653 655 657 658 659 704
RAND 502# 745
RDANS 574 613 668 680 692 745# 747
REXP 101 104#
RND1 43 658
RND2 43 85 659
RNDFN 83# 727
RNDFN2 84#
RNDFNE 117# 765
RNDLFN 79# 727 764
RNORM 99# 103
RPLUS 94 96#
SAVCHA 41 456
SEGFN 326# 796
SEGFNE 394# 797
SEGL 348 351#
SEGLP 385# 387
SEGNUL 346 356 361 367 390#
SEGR2 364 366#
SEGRNG 359 363#
SEGTY 355#
SEGTY2 357 360#
SEGX 391#
SEGX0 345 349#
SGNFLT 148 151#
SGNFN 142# 778
SGNFNE 160# 779
SGNPOS 151 154#
SGNX 150 157#
SOPRAT 39 188 238 391
SP 71# 167 168 169 171 173 175 177 191 200 215 233 236 264

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	270	272	281	282	285	288	291	303	304	312	313	316	333	334
	343	344	352	353	372	374	377	378	379	380	390	423	428	412
	416	417	418	431	433	434	439	448	451	457	458	460	550	554
START	33	739												
STPRO	41	388	401											
STRFN	444#	802												
STRFNE	465#	803												
T1	40	290	298	308	454	458								
T2	40	284	306	453										
T3	40													
TABB	169#	172												
TABC	170	173#												
TABFN	164#	781												
TABFNE	190#	782												
TABLES	36	598	622	724										
TABNON	176	179#												
TABNUL	178	188#												
TBLSEN	36	598	628											
TKS	32	746	748											
TMPSTC	554	756#												
TPB	32	734	736											
TPBEN1	532	539#												
TPBFH1	507	531#												
TPBUF1	531	534	535	537#										
TRYCOR	551	558#												
USR	474#	634												
USRARE	34	75#	632	658										
USRCOD	481	543#	637											
USRLIN	482	541#												
VAL	42	428												
VALCE	426#	429												
VALFN	398#	799												
VALFNE	440#	800												
VALJ	409	437#												
VALR	405	410#												
VALX	427	431#												
'	153	174	187	202	526	527#	528	537	538#	539	542#	755#	759	
,COMMA	48	246	250	328	335									
,RPAR	37	81	122	144	165	196	213	230	255	340	400	446		
$KBBSZ	56	527												
$STKSZ	44	654												
$TPBSZ	52	538												
$ULNSP	60	542												

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```
                        ;
                        ; BASIC/PTS PART3-BASICH
                        ;
                        ; DEC-11-LPTBA-A-LA3
                        ;
                        ; COPYRIGHT 1973
                        ;
                        ; DIGITAL EQUIPMENT CORPORATION
                        ; MAYNARD, MASSACHUSETTS 01754
```

```
                        .TITLE  BASIC V001A EDIT #020 (REF) 01/31/73
;                                       BASIC SOURCE FILE #15
;
;
;
;
;
;  USER AREA AND ONCE-ONLY INIT. CODE,
;
;  TO BE LINKED LAST AFTER BASICL AND FPMP-11 TO FORM BASIC,
;
;
;
;
;
;
;
;
```



```
;
; GLOBALS
;
        .GLOBL  TPB, IKS
        .GLOBL  START, FILLCO
        .GLOBL  USRAREA
        .GLOBL  LIMIT, POL, ARRAYS, PDSIZE
        .GLOBL  TABLES, TBLSEND
        .GLOBL  COLUMN, FAC1, FAC2, .RPAR
        .GLOBL  ERRMIX, ERRPOL, ERRSYN, ERRARG
        .GLOBL  EVAL, INT, MAKEST, OPRATO, SOPRAT
        .GLOBL  .COMMA, T1, T2, T3
        .GLOBL  ARGB, SAVCHAR, NUMSGN, STPRO
        .GLOBL  NORM, VAL
        .GLOBL  RND1, RND2
        .GLOBL  SSTKSZ ,IFPMP
;
;
;
;
; ASSEMBLY PARAMETERS
;
        .IFNDF  $TPBSZ  ;TELEPRINTER BUFFER SIZE
$TPBSZ  =20             ;CHARACTERS
        .ENDC
;
        .IFNDF  $KBBSZ  ;KEYBOARD BUFF, SIZE
$KBBSZ  =20             ;CHARACTERS
        .ENDC
;
        .IFNDF  $ULNSP  ;USER LINE SPACE
$ULNSP  =120            ;BYTES
        .ENDC
;
```

```
                        .CSECT
000000'                 R0      =%0
000001                  R1      =%1
000002                  R2      =%2
000003                  R3      =%3
000004                  R4      =%4
000005                  R5      =%5
000006                  SP      =%6
000007                  PC      =%7
000040                  BL      =40

000000' 000000          USRAREA::.WORD  0
                        BASICH::
                        ;RND FUNCTION -- GENERATE RANDOM NUMBER
                        ;       SCAN PAST ARG IF PRESENT
000002' 004737  000000G RNOLFN: JSR     PC,@#EVAL
000006' 103452          BCS     ERRNDA
000010' 122127  000000G         CMPB    (R1)+,#',RPAR
000014' 001045          BNE     ERRNDS
                        RNOFN:
000016' 010500          RNDFN2: MOV     R5,R0
000020' 062700  000000G         ADD     #RND2,R0
000024' 011003                  MOV     @R0,R3
000026' 014002                  MOV     -(R0),R2
000030' 006303                  ASL     R3              ;MULT BY 2
000032' 006102                  ROL     R2
000034' 062002                  ADD     (R0)+,R2        ;NOW BY 3
000036' 061003                  ADD     @R0,R3
000040' 005502                  ADC     R2
000042' 061002                  ADD     @R0,R2          ;NOW BY 2**16+3
000044' 100002                  BPL     RPLUS
000046' 062702  100000          ADD     #100000,R2      ;GET 2**32+G
000052' 010310          RPLUS:  MOV     R3,@R0          ;STORE NEW GENERATORS
000054' 010240                  MOV     R2,-(R0)
000056' 012700  000201          MOV     #201,R0         ;INITIAL EXPONENT
000062' 006303          RNORM:  ASL     R3              ;FLOAT RESULT
000064' 006102                  ROL     R2
000066' 103402                  BCS     REXP            ;JUMP WHEN LEADING BIT FOUND
000070' 005300                  DEC     R0              ;ADJUST EXPONENT FOR SHIFT
000072' 000773                  BR      RNORM
000074' 105003          REXP:   CLRB    R3
000076' 150203                  BISB    R2,R3
000100' 000303                  SWAB    R3
000102' 105002                  CLRB    R2
000104' 150002                  BISB    R0,R2           ;INSERT EXPONENT INTO RESULT
000106' 000302                  SWAB    R2
000110' 006002                  ROR     R2
000112' 006003                  ROR     R3              ;INSERT + SIGN
000114' 010265  000000G         MOV     R2,FAC1(R5)
000120' 010365  000000G         MOV     R3,FAC2(R5)
000124' 000137  000000G         JMP     @#OPRATOR
000130' 000137  000000G ERRNDS: JMP     @#ERRSYN
000134' 000137  000000G ERRNDA: JMP     @#ERRARG
                        RNOFNE:
```

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```
                        ;ABS FUNCTION ROUTINE
000140' 004737  000000G ABSFN:  JSR     PC,@#EVAL
000144' 103430          BCS     ERABSA
000146' 122127  000000G         CMPB    (R1)+,#',RPAR
000152' 001027          BNE     ERABSS
000154' 005765  000000G         TST     FAC1(R5)
000160' 001405          BEQ     ABSINT
000162' 100017          BPL     ABSX
000164' 042765  100000  000000G BIC     #100000,FAC1(R5)
000172' 000413          BR      ABSX
000174' 005765  000000G ABSINT: TST     FAC2(R5)
000200' 100010          BPL     ABSX
000202' 005465  000000G         NEG     FAC2(R5)
000206' 102005          BVC     ABSX
000210' 012765  044000  000000G MOV     #44000,FAC1(R5)
000216' 005065  000000G         CLR     FAC2(R5)
000222' 000137  000000G ABSX:   JMP     @#OPRATOR
000226' 000137  000000G ERABSA: JMP     @#ERRARG
000232' 000137  000000G ERABSS: JMP     @#ERRSYN
                        ABSFNE:
```

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```
                                        ;SGN FUNCTION ROUTINE
000236' 004737 000000G          SGNFN:  JSR     PC,@#EVAL
000242' 103424                          BCS     ERSGNA
000244' 122127 000000G                  CMPB    (R1)+,#,RPAR
000250' 001023                          BNE     ERSGNS
000252' 005000                          CLR     R0
000254' 005765 000000G                  TST     FAC1(R5)
000260' 001003                          BNE     SGNFLT
000262' 005765 000000G                  TST     FAC2(R5)
000266' 001410                          BEQ     SGNX
000270' 100002                  SGNFLT: BPL     SGNPOS
000272' 005300                          DEC     R0
000274' 000401                          BR      .+4
000276' 005200                  SGNPOS: INC     R0
000300' 010065 000000G                  MOV     R0,FAC2(R5)
000304' 005065 000000G                  CLR     FAC1(R5)
000310' 000137 000000G          SGNX:   JMP     @#OPRATOR
000314' 000137 000000G          ERSGNA: JMP     @#ERRARG
000320' 000137 000000G          ERSGNS: JMP     @#ERRSYN
                                SGNFNE:
```

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```
                                        ;TAB FUNCTION ROUTINE
000324' 004737 000000G          TABFN:  JSR     PC,@#ARGB
000330' 122127 000000G                  CMPB    (R1)+,#,RPAR
000334' 001036                          BNE     ERTABS
000336' 005046                          CLR     -(SP)
000340' 116516 000000G                  MOVB    FAC2(R5),(SP)
000344' 021627 000110           TABB:   CMP     (SP),#72.
000350' 103403                          BLO     TABC
000352' 162716 000110                   SUB     #72.,(SP)
000356' 000772                          BR      TABB
000360' 167516 000000G          TABC:   SUB     @COLUMN(R5),(SP)
000364' 100001                          BPL     .+4
000366' 005016                          CLR     (SP)
000370' 001002                          BNE     TABNON
000372' 005316                          DEC     (SP)
000374' 000414                          BR      TABNULL
000376' 010502                  TABNON: MOV     R5,R2
000400' 004737 000000G                  JSR     PC,@#MAKESTR
000404' 011600                          MOV     (SP),R0
000406' 005002                          CLR     R2
000410' 151002                          BISB    (R0),R2
000412' 062700 000003                   ADD     #3,R0
000416' 112720 000040                   MOVB    #BL,(R0)+
000422' 005302                          DEC     R2
000424' 003374                          BGT     .-6
000426' 000137 000000G          TABNULL:JMP     @#SOPRATR
000432' 000137 000000G          ERTABS: JMP     @#ERRSYN
                                TABFNE:
```

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```
                                        ; LEN FUNCTION ROUTINE
000436' 004737 000000G          LENFN:  JSR     PC,@#EVAL
000442' 103016                          BCC     ERLENA
000444' 122127 000000G                  CMPB    (R1)+,#,RPAR
000450' 001015                          BNE     ERLENS
000452' 005065 000000G                  CLR     FAC1(R5)
000456' 005065 000000                   CLR     FAC2(R5)
000462' 012602                          MOV     (SP)+,R2
000464' 005202                          INC     R2
000466' 001402                          BEQ     .+6
000470' 114265 000000G                  MOVB    -(R2),FAC2(R5)
000474' 000137 000000G                  JMP     @#OPRATOR
000500' 000137 000000G          ERLENA: JMP     @#ERRARG
000504' 000137 000000G          ERLENS: JMP     @#ERRSYN
                                LENFNE:
```

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```
                                        ; ASC FUNCTION ROUTINE
000510' 004737 000000G          ASCFN:  JSR     PC,@#EVAL
000514' 103023                          BCC     ERASCA
000516' 122127 000000G                  CMPB    (R1)+,#,RPAR
000522' 001022                          BNE     ERASCS
000524' 012602                          MOV     (SP)+,R2
000526' 020227 177777                   CMP     R2,#177777
000532' 001414                          BEQ     ERASCA
000534' 121227 000001                   CMPB    (R2),#1
000540' 001011                          BNE     ERASCA
000542' 005065 000000G                  CLR     FAC1(R5)
000546' 005065 000000G                  CLR     FAC2(R5)
000552' 116265 000003 000000G           MOVB    3(R2),FAC2(R5)
000560' 000137 000000G                  JMP     @#OPRATOR
000564' 000137 000000G          ERASCA: JMP     @#ERRARG
000570' 000137 000000G          ERASCS: JMP     @#ERRSYN
                                ASCFNE:

                                        ; CHR$ FUNCTION ROUTINE
000574' 004737 000000G          CHRSFN: JSR     PC,@#ARGB
000600' 122127 000000G                  CMPB    (R1)+,#,RPAR
000604' 001016                          BNE     ERCHRS
000606' 142765 000200 000000G           BICB    #200,FAC2(R5)   ;TAKE CHAR MOD 128
000614' 012746 000001                   MOV     #1,-(SP)
000620' 010502                          MOV     R5,R2
000622' 004737 000000G                  JSR     PC,@#MAKESTR
000626' 011600                          MOV     (SP),R0
000630' 116560 000000G 000003           MOVB    FAC2(R5),3(R0)
000636' 000137 000000G                  JMP     @#OPRATR
000642' 000137 000000G          ERCHRS: JMP     @#ERRSYN
                                CHRFNE:
```

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```
                                ; POS FUNCTION ROUTINE
000646' 004737 000000G  POSFN:  JSR     PC,@#EVAL
000652' 103133                  BCC     ERRPOSA
000654' 122127 000000G          CMPB    (R1)+,#,COMMA
000660' 001132                  BNE     ERRPOSS
000662' 004737 000000G          JSR     PC,@#EVAL
000666' 103125                  BCC     ERRPOSA
000670' 122127 000000G          CMPB    (R1)+,#,COMMA
000674' 001124                  BNE     ERRPOSS
000676' 004737 000000G          JSR     PC,@#EVAL
000702' 103517                  BCS     ERRPOSA
000704' 004737 000000G          JSR     PC,@#INT
000710' 122127 000000G          CMPB    (R1)+,#,RPAR
000714' 001114                  BNE     ERRPOSS
000716' 005000                  CLR     R0
000720' 005765 000000G          TST     FAC1(R5)
000724' 001077                  BNE     POSF
000726' 005765 000000G          TST     FAC2(R5)
000732' 003474                  BLE     POSF
000734' 156500 000000G          BISB    FAC2(R5),R0     ;R0 IS N
                                ;CHECK NULL XS
000740' 026627 000002 177777    CMP     2(SP),#177777
000746' 001002                  BNE     POSX
000750' 005000                  CLR     R0
000752' 000464                  BR      POSF
                                ;COMPUTE LENGTH OF XS
000754' 005002          POSX:   CLR     R2
000756' 157602 000002           BISB    @2(SP),R2
                                ;CHECK NULL YS
000762' 021627 177777           CMP     (SP),#177777
000766' 001004                  BNE     POSY
                                ;NULL YS, ANS IS MIN(N,LEN(XS))
000770' 020002                  CMP     R0,R2
000772' 003454                  BLE     POSF
000774' 010200                  MOV     R2,R0
000776' 000452                  BR      POSF
                                ;SAVE ADDR OF END OF YS IN T2
001000' 005003          POSY:   CLR     R3
001002' 157603 000000           BISB    @(SP),R3
001006' 061603                  ADD     (SP),R3
001010' 062703 000003           ADD     #3,R3
001014' 010365 000000G          MOV     R3,T2(R5)
001020' 012603                  MOV     (SP)+,R3
001022' 062703 000003           ADD     #3,R3
                                ;SAVE ADDR OF END OF XS IN T1
001026' 061602                  ADD     (SP),R2
001030' 062702 000003           ADD     #3,R2
001034' 010265 000000G          MOV     R2,T1(R5)
001040' 012602                  MOV     (SP)+,R2
001042' 060002                  ADD     R0,R2
001044' 062702 000002           ADD     #2,R2
                                ;FIND MATCHING FIRST CHARACTER
001050' 121322          POSFST: CMPB    (R3),(R2)+
001052' 001406                  BEQ     POSREM
001054' 005200          POSTRY: INC     R0
```

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```
001056' 020265 000000G          CMP     R2,T1(R5)
001062' 001372                  BNE     POSFST
001064' 005000                  CLR     R0
001066' 000417                  BR      POSF2
                                ;CHECK THAT REMAINING CHARS MATCH
001070' 010246          POSREM: MOV     R2,-(SP)
001072' 010346                  MOV     R3,-(SP)
001074' 005203                  INC     R3
001076' 020365 000000G  POSNXT: CMP     R3,T2(R5)
001102' 001410                  BEQ     POSF
001104' 020265 000000G          CMP     R2,T1(R5)
001110' 001402                  BEQ     POSNO
001112' 122223                  CMPB    (R2)+,(R3)+
001114' 001770                  BEQ     POSNXT
001116' 012603          POSNO:  MOV     (SP)+,R3
001120' 012602                  MOV     (SP)+,R2
001122' 000754                  BR      POSTRY
                                ;RETURN FROM FUNCTION
001124' 022626          POSF:   CMP     (SP)+,(SP)+
001126' 010065 000000G  POSF2:  MOV     R0,FAC2(R5)
001132' 005065 000000G          CLR     FAC1(R5)
001136' 000137 000000G          JMP     @#OPRATOR
001142' 000137 000000G  ERRPOSA: JMP    @#ERRARG
001146' 000137 000000G  ERRPOSS: JMP    @#ERRSYN
                        POSFNE:
```

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```
                                        ; SEG FUNCTION ROUTINE
001152' 004737  000000G         SEGFN:  JSR     PC,@#EVAL
001156' 103114                          BCC     ERSEGA
001160' 122127  000000G                 CMPB    (R1)+,#,COMMA
001164' 001113                          BNE     ERSEGS
001166' 004737  000000G                 JSR     PC,@#EVAL
001172' 103506                          BCS     ERSEGA
001174' 004737  000000G                 JSR     PC,@#INT
001200' 016546  000000G                 MOV     FAC1(R5),-(SP)
001204' 016546  000000G                 MOV     FAC2(R5),-(SP)
001210' 122127  000000G                 CMPB    (R1)+,#,COMMA
001214' 001077                          BNE     ERSEGS
001216' 004737  000000G                 JSR     PC,@#EVAL
001222' 103472                          BCS     ERSEGA
001224' 004737  000000G                 JSR     PC,@#INT
001230' 122127  000000G                 CMPB    (R1)+,#,RPAR
001234' 001067                          BNE     ERSEGS
                                        ;GET X VALUE IN R2
001236' 012602                          MOV     (SP)+,R2
001240' 012600                          MOV     (SP)+,R0
001242' 100403                          BMI     SEGX0
001244' 001055                          BNE     SEGNUL
001246' 005702                          TST     R2
001250' 003002                          BGT     SEGL
001252' 012702  000001          SEGX0:  MOV     #1,R2
                                        ;COMPUTE LENGTH OF AS IN R0
001256' 005000                  SEGL:   CLR     R0
001260' 021627  177777                  CMP     (SP),#177777    ;CHECK NULL STRING
001264' 157600  000000                  BISB    @(SP),R0
                                        ;GET Y VALUE IN R3
001270' 005765  000000G         SEGTY:  TST     FAC1(R5)
001274' 100441                          BMI     SEGNUL
001276' 001402                          BEQ     SEGTY2
001300' 010003                          MOV     R0,R3
001302' 000403                          BR      SEGRNG
001304' 016503  000000G         SEGTY2: MOV     FAC2(R5),R3
001310' 003433                          BLE     SEGNUL
                                        ;CHECK 0<=R2<=R3<=R0
001312' 020003                  SEGRNG: CMP     R0,R3
001314' 101001                          BHI     SEGR2
001316' 010003                          MOV     R0,R3
001320' 020203                  SEGR2:  CMP     R2,R3
001322' 101026                          BHI     SEGNUL
                                        ;COMPUTE LENGTH OF OUTPUT STRING
001324' 160203                          SUB     R2,R3
001326' 005203                          INC     R3
                                        ;MAKE NEW STRING OF THE CORRECT LENGTH
001330' 010246                          MOV     R2,-(SP)        ;SAVE START CHAR
001332' 010502                          MOV     R5,R2
001334' 010346                          MOV     R3,-(SP)
001336' 004737  0000000                 JSR     PC,@#MAKESTR
                                        ;FIX STACK AND MOVE IN CHARS FROM OLD STRING
001342' 012602                          MOV     (SP)+,R2        ;NEW STRING POINTER
001344' 012600                          MOV     (SP)+,R0        ;START CHAR
001346' 061600                          ADD     (SP),R0         ;ADD OLD STR POINTER
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001350' 010216                          MOV     R2,(SP)         ;SAVE NEW STRING
001352' 005003                          CLR     R3
001354' 151203                          BISB    (R2),R3         ;R3 IS NEW STRING LENGTH
001356' 062702  000003                  ADD     #3,R2           ;ADDR FIRST CHAR IN NEW STR
001362' 062700  000002                  ADD     #2,R0           ;ADDR START CHAR IN OLD STR
001366' 112022                  SEGLP:  MOVB    (R0)+,(R2)+     ;FILL IN NEW STRING
001370' 005303                          DEC     R3
001372' 001375                          BNE     SEGLP
001374' 000137  000000G                 JMP     @#STPRO
                                        ;OUTPUT NULL STRING
001400' 012716  177777          SEGNUL: MOV     #177777,(SP)
001404' 000137  000000G         SEGX:   JMP     @#SQFMATR
001410' 000137  000000G         ERSEGA: JMP     @#ERRARG
001414' 000137  000000G         ERSEGS: JMP     @#ERRSYN
                                SEGFNE:
```

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                                        ; VAL FUNCTION ROUTINE
001420' 004737  000000G         VALFN:  JSR     PC,@#EVAL
001424' 103056                          BCC     ERVALA
001426' 122127  000000G                 CMPB    (R1)+,#,RPAR
001432' 001051                          BNE     ERVALS
                                        ;READ STRING
001434' 011600                          MOV     (SP),R0
001436' 020027  177777                  CMP     R0,#177777      ;CHECK NULL STRING
001442' 001006                          BNE     VALR
001444' 005065  000000G                 CLR     FAC1(R5)
001450' 005065  000000G                 CLR     FAC2(R5)
001454' 005726                          TST     (SP)+
001456' 000435                          BR      VALJ
001460' 005002                  VALR:   CLR     R2
001462' 151002                          BISB    (R0),R2
001464' 010216                          MOV     R2,(SP)
001466' 062700  000003                  ADD     #3,R0
001472' 060002                          ADD     R0,R2
001474' 105012                          CLRB    (R2)
001476' 010446                          MOV     R4,-(SP)
001500' 010146                          MOV     R1,-(SP)
001502' 010246                          MOV     R2,-(SP)
                                        ;READ ASCII NUMBER AND EXPONENT
001504' 004737  000000G                 JSR     PC,@#VAL
                                        ;NORMALIZE TO FORM FLT PT NUMBER
001510' 004737  000000G                 JSR     PC,@#NORM
001514' 010365  000000G                 MOV     R3,FAC1(R5)
001520' 010465  000000G                 MOV     R4,FAC2(R5)
                                        ;CHECK END OF STRING
001524' 105710                  VALCE:  TSTB    (R0)
001526' 001403                          BEQ     VALX
001530' 122027  000040                  CMPB    (R0)+,#' 
001534' 001773                          BEQ     VALCE
                                        ;RESTORE REGS AND RETURN TO EVAL
001536' 020026                  VALX:   CMP     R0,(SP)+
001540' 001010                          BNE     ERVALA
001542' 012601                          MOV     (SP)+,R1
001544' 012604                          MOV     (SP)+,R4
001546' 012602                          MOV     (SP)+,R2
001550' 110218                          MOVB    R2,(R0)         ;RESTORE STRING LENGTH
001552' 000137  000000G         VALJ:   JMP     @#OPRATOR
001556' 000137  000000G         ERVALS: JMP     @#ERRSYN
001562' 000137  000000G         ERVALA: JMP     @#ERRARG
                                VALFNE:
```

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                                        ; STR FUNCTION ROUTINE
001566' 004737  000000G         STRFN:  JSR     PC,@#EVAL
001572' 103432                          BCS     ERSTRA
001574' 122127  000000G                 CMPB    (R1)+,#,RPAR
001600' 001031                          BNE     ERSTRS
001602' 012746  000020                  MOV     #20,-(SP)
001606' 010502                          MOV     R5,R2
001610' 004737  000000G                 JSR     PC,@#MAKESTR
001614' 011603                          MOV     (SP),R3
001616' 062703  000003                  ADD     #3,R3
001622' 010365  000000G                 MOV     R3,T2(R5)
001626' 005065  000000G                 CLR     T1(R5)
001632' 004737  000000G                 JSR     PC,@#NUMSGN
001636' 000000G                         ,WORD   SAVCHAR
001640' 010602                          MOV     SP,R2
001642' 016546  000000G                 MOV     T1(R5),-(SP)
001646' 004737  000000G                 JSR     PC,@#MAKESTR
001652' 012616                          MOV     (SP)+,(SP)
001654' 000137  000000G                 JMP     @#STPRO         ;PROTECT STRING

001660' 000137  000000G         ERSTRA: JMP     @#ERRARG
001664' 000137  000000G         ERSTRS: JMP     @#ERRSYN
                                STRFNE:
                                FNEND:
```

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                        ;
                        ;
                        ; USER AREA STORAGE CELLS
                        ;
001670' 000000  USR:    .WORD   0               ;SYMBOLS
001672' 000000          .WORD   0               ;LIMIT
001674' 000000          .WORD   0               ;POL
001676' 000000          .WORD   0               ;PDSIZE
001700' 000000          .WORD   0               ;ARRAYS
001702' 000000          .WORD   0               ;HIFREE
001704' 000000          .WORD   0               ;LOFREE
001706' 002214'         .WORD   USRCODE         ;CODE
001710' 002074'         .WORD   USRLINE         ;LINE
001712' 000000          .WORD   0               ;VARSAV
001714' 000000          .WORD   0               ;SS1SAV
001716' 000000          .WORD   0               ;SS2SAV
001720' 000000          .WORD   0               ;LINENO
001722' 000000          .WORD   0               ;GSUBCTR
001724' 000000          .WORD   0               ;COLUMN
001726' 000000          .WORD   0               ;CLMNTTY
001730' 000000          .WORD   0               ;FAC1
001732' 000000          .WORD   0               ;FAC2
001734' 000000          .WORD   0               ;R0SAVE
001736' 000000          .WORD   0               ;R1SAVE
001740' 000000          .WORD   0               ;R2SAVE
001742' 000000          .WORD   0               ;R3SAVE
001744' 000000          .WORD   0               ;R4SAVE
001746' 000000          .WORD   0               ;T1
001750' 000000          .WORD   0               ;T2
001752' 000000          .WORD   0               ;T3
001754' 000000          .WORD   0               ;RND1
001756' 000000          .WORD   0               ;RND2
001760' 000000  RAND:   .WORD   0               ;RNDCT
001762' 000000          .WORD   0               ;LOSTR
001764' 000000          .WORD   0               ;HISTR
001766'     000         .BYTE   0               ;ODEV
001767'     000         .BYTE   0               ;IDEV
001770' 002040'         .       TPBFW1          ;TPWD
001772' 002004'         .       KBBFW1          ;KBWD
001774' 000000          .WORD   0               ;ECHOSP
001776'     000         .BYTE   0               ;CNCFLG
001777'     000         .BYTE   0               ;CNOFLG
002000'     000         .BYTE   0               ;FILLCO
002001'     000         .BYTE   0               ;FILLNO
002002'     000         .BYTE   0               ;FILLCH
002003'     000         .BYTE   0               ; [SPARE BYTE]
```

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                        ;
                        ; USER I/O BUFFER AND BUFFER HDR, SPACE (TTY)
                        ;
002004' 002020'  KBBFW1: .       KBBUF1         ;BSTPT
002006' 002037'          .       KBBEN1         ;BEND
002010' 002020'          .WORD   KBBUF1         ;BGET1
002012' 002020'          .WORD   KBBUF1         ;BGET2
002014' 002020'          .WORD   KBBUF1         ;BPUT
002016' 000000           .       0              ;BFSPEC
         002020' KBBUF1: .=.
                 002040'         .=.+$KBBSZ     ;DEFAULT SIZE = 20 CHARS.
         002037' KBBEN1: .=.-1
                         .EVEN
                        ;
002040' 002054'  TPBFW1: .       TPBUF1         ;BSTPT
002042' 002073'          .       TPBEN1         ;BEND
002044' 000000           .       0              ;BGET1 (NOT USED)
002046' 002054'          .WORD   TPBUF1         ;BGET2
002050' 002054'          .WORD   TPBUF1         ;BPUT
002052' 000000           .       0              ;BFSPEC
         002054' TPBUF1: .=.
                 002074'         .=.+$TPBSZ     ;DEFAULT = 20 CHARS.
         002073' TPBEN1: .=.-1
                         .EVEN
                        USRLINE:
                        .=.+$ULNSP              ;DEFAULT = 120
002214'                 USRCODE:
```

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                                        ;
                                        ; --ONCE-ONLY INIT' CODE
                                        ;     FIND OUT HOW MUCH CORE AND EXPAND USRAREA ACCORDINGLY
                                        ;
002214' 162704  017770          DECCORE:SUB     #17770,R4       ;COME HERE ON TRAP FOR BAD MEM'
002220' 022626                          CMP     (SP)+,(SP)+
002222' 000412                          BR      TRYCORE         ;  REF', AND DEC, CORE SIZE
                                        ;
002224' 000005                  ONCEONL:RESET
002226' 012706  003364'                 MOV     #TMPSTK,SP      ;TEMP' STACK
002232' 004767  000000G                 JSR     PC,FPMP         ;INIT FOR FPMP ROUTINES
002236' 012737  002214' 000004          MOV     #DECCORE,@#4    ;SET UP TRAP ADDR'
002244' 012704  160000                  MOV     #160000,R4      ;28K
002250' 005744                  TRYCORE:TST     -(R4)           ;TRAPS TO DECCORE IF BAD ADDR
002252' 012737  000006  000004          MOV     #6,@#4          ;FALLS THRU IF OK - RESTORE TRAP ADDR'
002260' 010467  001100                  MOV     R4,HICORE
                                        ;
                                        ;INITIALIZE TOP OF BASIC
002264' 012701  000002'                 MOV     #BASICH,R1
                                        ;PRINT HEADING AND READ ANSWER
002270' 004367  000756          INIHD:  JSR     R3,PRMSG
002274'     015     012                 .BYTE   15,12
002276' 042502  044523  020103          .ASCII  'BASIC V001A'
        002304' 030120  030460      101
002311'     015     012                 .BYTE   15,12
002313'     117  052120  043040        .ASCII  'OPT FNS: A=ALL, N=NONE, I=IND'
        002320' 051516  020072  020501
        002326' 046101  026114  047040
        002334' 047055  047117  026105
        002342' 044440  044455  042116
002350'     015     012                 .BYTE   15,12
002352'     077                         .ASCII  '?'
002353'     000                         .BYTE   0
                                        .EVEN
002354' 004767  000722                  JSR     PC,RDANS
002360' 120027  000116                  CMPB    R0,#'N          ;CHECK FOR N
002364' 001512                          BEQ     INISAV
002366' 005002                          CLR     R2              ;CLEAR ALL FLAG
002370' 120027  000101                  CMPB    R0,#'A          ;CHECK FOR A
002374' 001002                          BNE     INITI
002376' 005202                          INC     R2              ;SET ALL FLAG
002400' 000415                          BR      INIALL
002402' 120027  000111          INITI:  CMPB    R0,#'I          ;CHECK FOR I
002406' 001338                          BNE     INIHD
                                        ;PRINT HEADING FOR INDIV FUNCTIONS
002410' 004367  000036                  JSR     R3,PRMSG
002414'     015     012     012         .BYTE   15,12,12
002417'     040  026531  042531        .ASCII  ' V=YES  N=NO'
        002424' 020123  047040  047055
        002432'     117
002433'     000                         .BYTE   0
002434' 012705  003374'         INIALL: MOV     #FNTAB,R5
002440' 012704  000000G                 MOV     #TABLE5,R4
                                        ;GET NEXT FUNCTION TABLE ADDRESS
002444' 011503                  INILP:  MOV     (R5),R3
```

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002446' 100005                          BPL     INIFN
002450' 062705  000002                  ADD     #2,R5           ;SKIP A FUNCTION
002454' 062704  000002                  ADD     #2,R4
002460' 000771                          BR      INILP
                                        ;PRINT QUESTION FOR FUNCTION, GET ANSWER
002462' 020427  000000G         INIFN:  CMP     R4,#TBL5END
002466' 101051                          BHI     INISAV
002470' 020527  003544'                 CMP     R5,#FNTABE
002474' 103046                          BHIS    INISAV
002476' 005702                          TST     R2
002500' 001027                          BNE     INIOF
002502' 016567  000004  000014          MOV     4(R5),FNNAM1
002510' 016567  000006  000010          MOV     6(R5),FNNAM2
002516' 004367  000530                  JSR     R3,PRMSG
002522'     015     012                 .BYTE   15,12
002524' 000000                  FNNAM1: .WORD   0
002526' 000000                  FNNAM2: .WORD   0
002530' 035040     040                  .ASCII  ' ? '
002533'     000                         .BYTE   0
                                        .EVEN
002534' 004767  000542                  JSR     PC,RDANS
002540' 120027  000116                  CMPB    R0,#'N          ;CHECK FOR N
002544' 001002                          BNE     INITY
002546' 005724                          TST     (R4)+
002550' 000413                          BR      ININXT
002552' 120027  000131          INITY:  CMPB    R0,#'Y          ;CHECK FOR Y
002556' 001341                          BNE     INIFN
                                        ;DEFINE THE FUNCTION
002560' 010100                  INIOF:  MOV     R1,R0
002562' 162700  000000G                 SUB     #TABLE5,R0
002566' 010024                          MOV     R0,(R4)+        ;PLACE ADDRESS IN TABLE
002570' 012321                  ININV:  MOV     (R3)+,(R1)+
002572' 020365  000002                  CMP     R3,2(R5)
002576' 103774                          BLO     ININV
002600' 062705  000010          ININXT: ADD     #10,R5
002604' 020427  000000G                 CMP     R4,#TBL5END
002610' 101715                          BLOS    INILP
                                        ;SAVE TOP OF BASIC
002612' 010167  175192          INISAV: MOV     R1,USRAREA
                                        ;MOVE USER AREA TO TOP OF BASIC
002616' 012702  001070'                 MOV     #USR,R2
002622' 010203                          MOV     R2,R3           ;COMPUTE RELOCATION CONSTANT
002624' 160103                          SUB     R1,R3
002626' 020227  002214'         MOVLP:  CMP     R2,#USRCODE
002632' 103005                          BHIS    MOVDON
002634' 012221                          MOV     (R2)+,(R1)+
002636' 001773                          BEQ     MOVLP
002640' 160341                          SUB     R3,-(R1)        ;RELOCATE NON-ZERO ENTRIES
002642' 005721                          TST     (R1)+
002644' 000770                          BR      MOVLP
                                MOVDON:
```

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                                        ;INITIALIZE USER AREA
002646' 016704 000512                           MOV     HICORE,R4       ;R4 IS HIGHEST ADDR, IN CORE
002652' 162704 000300                           SUB     #300,R4
002656' 016705 175116                           MOV     USRAREA,R5
002662' 010465 000000G                          MOV     R4,LIMIT(R5)
002666' 162704 000134                           SUB     #134,R4         ;POINTER SPACE
002672' 010465 000000G                          MOV     R4,POL(R5)      ;BASE OF STACK
002676' 162704 000000G                          SUB     #STKSZ,R4       ;MAX, STACK SIZE
002702' 010465 000000G                          MOV     R4,ARRAYS(R5)   ;HIEST ARRAY STOR, LOC;
002706' 062704 000040                           ADD     #40,R4
002712' 010465 000000G                          MOV     R4,POSIZE(R5)
002716' 012765 032331 000000G                   MOV     #32331,RND1(R5)
002724' 012765 163291 000000G                   MOV     #163291,RND2(R5)

                                        ;DIALOGUE TO SET UP TERMINAL TYPE
002732' 005003                          ASKSER: CLR     R3
002734' 004367 000312                           JSR     R3,PRMSG
002740'    015    012    012                   .BYTE   15,12,12
002743'    106 051501 020124                    .ASCII  'FAST SER TERM?'
002750' 042523 020122 042524
002756' 046522    077
002761'    000                                  .BYTE   0
                                                .EVEN
002762' 004767 000314                           JSR     PC,RDANS
002766' 120027 000116                           CMPB    R0,#'N
002772' 001457                                  BEQ     ASKDON
002774' 120027 000131                           CMPB    R0,#'Y
003000' 001354                                  BNE     ASKSER
003002' 005203                                  INC     R3

003004' 004367 000242                   ASKLA:  JSR     R3,PRMSG
003010'    015    012                           .BYTE   15,12
003012' 040514 030063 024040                    .ASCII  'LA30 (300 BAUD)?'
003020' 030063 020060 040562
003026' 042125 037451
003032'    000                                  .BYTE   0
003034'                                         .EVEN
003034' 004767 000242                           JSR     PC,RDANS
003040' 120027 000131                           CMPB    R0,#'Y
003044' 001432                                  BEQ     ASKDON
003046' 120027 000116                           CMPB    R0,#'N
003052' 001354                                  BNE     ASKLA
003054' 005203                                  INC     R3

003056' 004367 000170                   ASKVT:  JSR     R3,PRMSG
003062'    015    012                           .BYTE   15,12
003064' 052126 032460 024040                    .ASCII  'VT05 (>=600 BAUD)?'
003072' 036476 030066 020060
003100' 040562 042125 037451
003106'    000                                  .BYTE   0
003107'                                         .EVEN
003110' 004767 000166                           JSR     PC,RDANS
003114' 120027 000131                           CMPB    R0,#'Y
003120' 001404                                  BEQ     ASKDON
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003122' 120027 000116                           CMPB    R0,#'N
003126' 001353                                  BNE     ASKVT
003130' 000700                                  BR      ASKSER

003132' 010302                          ASKDON: MOV     R3,R2
003134' 001412                                  BEQ     FILLDON
003136' 006303                                  ASL     R3
003140' 060302                                  ADD     R3,R2
003142' 062702 003303'                          ADD     #FILLTB,R2
003146' 010503                                  MOV     R5,R3
003150' 062703 000000G                          ADD     #FILLCO,R3
003154' 112223                                  MOVB    (R2)+,(R3)+
003156' 112223                                  MOVB    (R2)+,(R3)+
003160' 112223                                  MOVB    (R2)+,(R3)+
                                        FILLDON:
                                        ;PRINT OUT IF USER FUNCTIONS LOADED
003162' 005737 000046                           TST     @#46
003166' 001414                                  BEQ     NOUSR
003170' 004367 000056                           JSR     R3,PRMSG
003174'    015    012    012                   .BYTE   15,12,12
003177'    125 042523 020122                    .ASCII  'USER FNS LOADED'
003204' 047106 020123 047514
003212' 042101 042105
003216'    000                                  .BYTE 0
003220'                                         .EVEN
                                        NOUSR:
003220' 004367 000026                           JSR     R3,PRMSG
003224'    015    012    012                   .BYTE   15,12,12,0
003227'    000
                                                .EVEN

                                        ;CHECK IF RNDL LOADED
003230' 012702 000000G                          MOV     #TABLES,R2
003234' 012203                                  MOV     (R2)+,R3
003236' 001403                                  BEQ     NORND
003240' 062703 000014                           ADD     #RNDFN-RNDLFN,R3
003244' 010312                                  MOV     R3,(R2)         ;DEFINE RND ALSO
                                        NORND:
003246' 000167 000000G                          JMP     START

                                        ;SUBROUTINE TO PRINT A MESSAGE
003252' 010300                          PRMSG:  MOV     R3,R0
003254' 105737 177776G                  PRLP:   TSTB    @#TPS+2
003260' 100375                                  BPL     PRLP
003262' 112037 000000G                          MOVB    (R0)+,@#TPB
003266' 001372                                  BNE     PRLP
003270' 010003                                  MOV     R0,R3
003272' 005203                                  INC     R3
003274' 006203                                  ASR     R3
003276' 006303                                  ASL     R3
003300' 000203                                  RTS     R3

                                        ;SUBROUTINE TO READ ANSWER FROM TELETYPE
003302' 005267 176492                   RDANS:  INC     RAND
003306' 105737 000000G                          TSTB    @#TKS
```

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747  003312' 100373                          BPL     RDANS
748  003314' 113700 0000020                  MOVB    @#TKS+2,R0
749  003320' 042700 177000                   BIC     #177000,R0
750  003324' 010067 000004                   MOV     R0,INCH
751  003330' 004367 177710                   JSR     R3,PRMSG
752  003334' 000000                  INCH:   .WORD   0
753  003336' 016700 177772                   MOV     INCH,R0
754  003342' 000207                          RTS     PC
755          003364'                         .=.+20
756                                  ;
757  003364' 000000                  HICORE: .WORD   0
758
759          003363'                 FILLTB: .=.-3
760  003366'    000     011     015          .BYTE   0,11,15         ;LA30
761  003371'    000     004     012          .BYTE   0,04,12         ;VT05
762
763                                  FNTAB:
764  003374' 000002'                         .WORD   RNDLEN
765  003376' 000140'                         .WORD   RNDFNC
766  003400' 047122  020104                  .ASCII  /RND /
767  003404' 177777                          .WORD   -1              ; RND
768  003406' 177777                          .WORD   -1              ; SIN
769  003410' 177777                          .WORD   -1              ; COS
770  003412' 177777                          .WORD   -1              ; SQR
771  003414' 177777                          .WORD   -1              ; ATN
772  003416' 177777                          .WORD   -1              ; EXP
773  003420' 177777                          .WORD   -1              ; LOG
774  003422' 000140'                         .WORD   ABSFN           ; ABS
775  003424' 000236'                         .WORD   ABSFNC
776  003426' 041101  020123                  .ASCII  /ABS /
777  003432' 177777                          .WORD   -1              ; INT
778  003434' 000236'                         .WORD   SGNFN           ; SGN
779  003436' 000324'                         .WORD   SGNFNC
780  003440' 043523  020116                  .ASCII  /SGN /
781  003444' 000324'                         .WORD   TABFN           ; TAB
782  003446' 000436'                         .WORD   TABFNC
783  003450' 040524  020102                  .ASCII  /TAB /
784  003454' 000436'                         .WORD   LENFN           ; LEN
785  003456' 000510'                         .WORD   LENFNC
786  003460' 042514  020116                  .ASCII  /LEN /
787  003464' 000510'                         .WORD   ASCFN           ; ASC
788  003466' 000574'                         .WORD   ASCFNC
789  003470' 051501  020103                  .ASCII  /ASC /
790  003474' 000574'                         .WORD   CHRSFN          ; CHR$
791  003476' 000646'                         .WORD   CHRFNC
792  003500' 044103  022122                  .ASCII  /CHR$/
793  003504' 000646'                         .WORD   POSFN           ; POS
794  003506' 001152'                         .WORD   POSFNC
795  003510' 047520  020123                  .ASCII  /POS /
796  003514' 001152'                         .WORD   SEGFN           ; SEG
797  003516' 001420'                         .WORD   SEGFNC
798  003520' 042523  022107                  .ASCII  /SEG$/
799  003524' 001420'                         .WORD   VALFN           ; VAL
800  003526' 001566'                         .WORD   VALFNC
801  003530' 040526  020114                  .ASCII  /VAL /
```

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```
802  003534' 001566'                         .WORD   STRFN           ; STR
803  003536' 001670'                         .WORD   STRFNC
804  003540' 052123  022122                  .ASCII  /STR$/
805                                  FNTABE:
806
807          002224'                         .END    ONCEONL
```

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```
ABSFN    000140R     ABSFNE   000236R     ABSINT   000174R     ABSX     000222R
ARGB   = ******  G   ARRAYS = ******  G   ASCFN    000510R     ASCFNE   000574R
ASKDON   003132R     ASKLA    003004R     ASKSER   002732R     ASKVT    003056R
BASICH   000002R     BL     = 000040      CHRFNE   000646R     CHRSFN   000574R
COLUMN = ******  G   DECCOR   002214R     ERABSA   000226R     ERABSS   000232R
ERASCA   000564R     ERASCS   000570R     ERCHRS   000642R     ERLENA   000900R
ERLENS   000504R     ERPOSA   001142R     ERPOSS   001146R     ERRARG = ******  G
ERRMIX = ******  G   ERRNOA   000136R     ERRNOS   000130R     ERRPOL = ******  G
ERRSYN = ******  G   ERSEGA   001418R     ERSEGS   001414R     ERSGNA   000314R
ERSGNS   000320R     ERSTRA   001660R     ERSTRS   001604R     ERYABS   000432R
ERVALA   001562R     ERVALS   001556R     EVAL   = ******  G   FAC1   = ******  G
FAC2   = ******  G   FILLCO = ******  G   FILLDO   003102R     FILLTB = 003363R
FNEND    001670R     FNNAM1   002524R     FNNAM2   002526R     FNTAB    003374R
FNTABE   003544R     HICORE   003364R     IFPMP  = ******  G   INCH     003334R
INIALL   002434R     INIOF    002560R     ININFN   002462R     ININHO   002270R
INILP    002444R     ININV    002570R     ININXT   002600R     INISAV   002612R
INITI    002402R     INITY    002552R     INT    = ******  G   KBBEN1 = 002037R
KBBFH1   002004R     KBBUF1 = 002020R     LENFN    000436R     LENFNE   000510R
LIMIT  = ******  G   MAKEBT = ******  G   MOVDON   002646R     MOVLP    002626R
NORM   = ******  G   NORND    003246R     NOUSR    003220R     NUMSGN = ******  G
ONCEON   002224R     OPRATO = ******  G   PC     =%000007      POL    = ******  G
POSIZE = ******  G   POSF     001124R     POSFN    000646R     POSFNE   001152R
POSFST   001058R     POSF2    001126R     POSNO    001116R     POSNXT   001070R
POSREM   001078R     POSTRY   001054R     POSX     000774R     POSY     001000R
PRLP     003254R     PRMSG    003252R     RAND     001700R     RDANS    003302R
REXP     000074R     RNDFN    000010R     RNDFNE   000140R     RNDFN2   000010R
RNDLFN   000002R     RND1   = ******  G   RND2   = ******  G   RNDRM    000062R
RPLUS    000052R     R0     =%000000      R1     =%000001      R2     =%000002
R3     =%000003      R4     =%000004      R5     =%000005      SAVCHA = ******  G
SEGFN    001152R     SEGFNE   001420R     SEGL     001256R     SEGLP    001366R
SEGNUL   001400R     SEGRNG   001312R     SEGR2    001320R     SEGTY    001270R
SEGTY2   001304R     SEGX     001404R     SEGX0    001252R     SGNFLT   000270R
SGNFN    000236R     SGNFNE   000324R     SGNPOS   000276R     SGNX     000310R
SOPRAT = ******  G   SP     =%000006      START  = ******  G   STPRO  = ******  G
STRFN    001566R     STRFNE   001670R     TABB     000344R     TABC     000360R
TABFN    000324R     TABFNE   000436R     TABLES = ******  G   TABNON   000376R
TABNUL   000426R     TBLSEN = ******  G   TKS    = ******  G   TMPSTC   003364R
TPB    = ******  G   TPBEN1 = 002073R     TPBFH1   002040R     TPBUF1 = 002054R
TRYCOR   002250R     T1     = ******  G   T2     = ******  G   T3     = ******  G
USR      001670R     USRARE   000000RG     USRCOD   002214R     USRLIN   002074R
VAL    = ******  G   VALCE   001524R     VALFN    001420R     VALFNE   001360R
VALJ     001552R     VALR     001460R     VALX     001536R     %KBBSZ = 000020
%STKSZ = ******  G   %TPBSZ = 000020      ,COMMA = ******  G
,RPAR  = ******  G   .       = 003044R
```

ERRORS DETECTED: 0

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RUN-TIME: 18 SECONDS
CORE USED: 3K

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ABSFN 120# 774
ABSFNE 138# 775
ABSINT 125 129#
ABSX 126 128 130 132 135#
ARGB 41 164 229
ARRAYS 35 655
ASCFN 211# 787
ASCFNE 226# 788
ASKDON 670 682 694 699#
ASKLA 675# 684
ASKSER 662# 672 697
ASKVT 687# 696
BASICH 76# 563
BL 73# 185 428
CHRFNE 248# 791
CHRSFN 229# 790
COLUMN 37 173
DECCOR 549# 556
ERABSA 121 136#
ERABSS 123 137#
ERASCA 212 217 219 224#
ERASCS 214 225#
ERCHRS 231 239#
ERLENA 195 205#
ERLENS 197 206#
ERPOSA 245 249 253 320#
ERPOSS 247 251 256 321#
ERRARG 38 116 136 158 285 224 328 392 439 463
ERRMIX 38
ERRNDA 80 116#
ERRNDS 82 115#
ERRPOL 38
ERRSYN 38 115 137 159 189 286 229 239 321 393 438 464
ERSEGA 327 331 338 392#
ERSEGS 329 336 341 393#
ERSGNA 143 158#
ERSGNS 145 159#
ERSTRA 445 463#
ERSTRS 447 464#
ERTABS 166 189#
ERVALA 399 432 439#
ERVALS 401 438#
EVAL 39 79 120 142 194 211 244 248 252 326 330 337 398 444
FAC1 37 112 124 127 133 147 150 198 220 298 318 333 355 426
423
FAC2 37 113 129 131 134 149 155 168 199 283 221 222 232 237
260 262 317 334 368 407 424
FILLCO 33 785
FILLDO 780 789#
FILLTB 783 759#
FNEND 466#
FNNAM1 604 608#
FNNAM2 605 609#

FNTAB 589 763#
FNTABE 600 805#
HICORE 560 648 797#
IFPMP 44 555
INCH 750 752# 753
INIALL 581 589#
INIOF 603 621#
INIFN 593 598# 619
INIHD 565# 583
INILP 592# 596 629
INIMV 624# 626
ININXT 617 627#
INISAV 576 599 601 632#
INITI 579 582#
INITY 615 618#
INT 39 254 332 339
KBBEN1 521 528#
KBBFH1 508 520#
KBBUF1 520 522 523 524 526#
LENFN 194# 784
LENFNE 207# 785
LIMIT 35 651
MAKEST 39 180 235 375 450 459
MOVDON 638 644#
MOVLP 637# 640 643
NORM 42 422
NORND 726 729#
NOUSR 712 718#
NUMSGN 41 455
ONCEON 553# 807
OPRATO 39 114 135 157 204 223 319 437
PC 72# 79 120 142 164 180 194 211 229 235 244 248 252 254
326 330 332 337 339 375 398 420 422 444 450 455 459 555
574 613 666 680 692 754
POL 35 653
POSIZE 35 657
POSF 259 261 267 276 278 307 310#
POSF2 301 317#
POSFN 244# 793
POSFNE 322# 794
POSFST 295# 299
POSNO 309 312#
POSNXT 306# 311
POSREM 296 303#
POSTRY 297# 314
POSX 265 269#
POSY 273 280#
PRLP 734# 735 737
PRMSG 565 585 686 663 675 687 713 719 733# 751
R0 65# 84 85 86 87 90 91 93 96 97 98 172 178 146
152 154 155 181 183 184 189 236 237 257 262 266 275 277
292 297 308 317 344 351 353 358 363 365 378 379 384 385
403 404 411 413 414 426 428 431 436 575 578 582 614 618

621 622 623 669 671 681 683 693 695 733 736 738 748 749
750 753
R1 66# 81 122 144 165 196 213 230 246 250 255 328 335 340
400 417 433 446 563 621 624 632 636 639 641 642
R2 67# 87 89 90 92 93 95 97 100 105 107 108 109 110
112 179 182 183 186 200 201 203 215 216 218 222 234 269
270 275 277 288 289 290 291 292 293 295 298 303 308 310
313 343 347 349 366 369 372 373 377 380 382 383 385 410
411 412 414 415 418 435 436 449 457 577 580 672 634 635
637 639 699 702 703 706 707 708 724 725 728
R3 68# 86 88 91 96 99 104 105 106 111 113 280 281 282
283 284 285 286 295 304 305 306 310 312 358 360 363 365
366 369 370 374 381 382 386 423 451 452 453 565 585 592
606 624 625 635 636 641 662 663 673 675 685 687 699 701
702 704 705 706 707 708 713 719 725 727 728 733 738 739
740 741 742 751
R4 69# 416 424 434 549 557 558 560 590 595 598 616 623 678
648 649 651 692 653 654 655 656 657
R5 70# 84 112 113 124 127 129 131 133 134 147 149 155 156
168 173 179 198 199 203 220 221 222 232 234 237 258 260
262 284 290 298 306 308 317 318 333 334 355 360 373 476
407 423 424 449 453 454 458 589 592 594 600 604 605 625
627 658 651 653 655 657 658 659 704
RAND 582# 745
RQANS 574 613 600 600 692 745# 747
REXP 101 104#
RND1 43 658
RND2 43 85 659
RNDFN 83# 727
RNDFN2 84#
RNDFNE 117# 765
RNDLFN 79# 727 704
RNORM 99# 103
RPLUS 94 96#
SAVCHA 41 456
SEGFN 326# 796
SEGFNE 394# 797
SEGL 348 351#
SEGLP 385# 387
SEGNUL 346 356 361 367 398#
SEGR2 364 366#
SEGRNG 359 363#
SEGTY 355#
SEGTY2 357 368#
SEGX 391#
SEGXB 345 349#
SGNFLT 148 151#
SGNFN 142# 778
SGNFNE 160# 779
SGNPOS 151 154#
SGNX 150 157#
SOPRAT 39 188 238 391
SP 71# 167 168 169 171 173 175 177 181 200 215 233 236 264

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270 272 281 282 285 288 291 303 304 312 313 316 333 334
343 344 352 353 372 374 377 378 379 380 390 403 408 412
416 417 418 431 433 434 435 448 451 457 458 460 550 594
START 33 738
STPRO 41 388 401
STRFN 444# 802
STRFNE 465# 803
T1 40 298 298 388 454 458
T2 40 284 306 453
T3 40
TABB 169# 172
TABC 178 173#
TABFN 164# 781
TABFNE 190# 782
TABLES 36 598 622 724
TABNON 176 179#
TABNUL 178 188#
TBLSEN 36 598 628
TKS 32 746 748
TMPSTC 554 756#
TPB 32 734 736
TPBEN1 532 539#
TPBFH1 507 531#
TPBUF1 531 534 535 537#
TRYCOR 551 558#
USR 474# 634
USRARE 34 75# 632 650
USRCOD 481 543# 637
USRLIN 482 541#
VAL 42 428
VALCE 426# 429
VALFN 398# 799
VALFNE 440# 800
VALJ 489 437#
VALR 485 418#
VALX 427 431#
, 153 174 187 202 526 527# 528 537 538# 539 542# 755# 759
,COMMA 40 246 250 328 335
,RPAR 37 81 122 144 165 196 213 230 255 340 400 446
SKBBSZ 56 527
SSTKSZ 44 654
STPBSZ 52 538
SULNSP 60 542

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```
                        ; BASIC/PTS  PART2-FPMP
                        ;
                        ; DEC-11-LPTBA-A-LA2
                        ;
                        ; COPYRIGHT 1973
                        ;
                        ; DIGITAL EQUIPMENT CORPORATION
                        ; MAYNARD, MASSACHUSETTS 01754
```



```
                        ;                                       BASIC SOURCE FILE #9
                        ; $BAS = FPMP FOR BASIC
          000001        $BAS=1
          000001        CND$2=1
          000001        CND$3=1
          000001        CND$18=1
          000001        CND$28=1
          000001        CND$27=1
          000001        CND$30=1

                                .GLOBL  ERRFPU ,IFPMP

                        ;INITIALIZE FPMP ROUTINE
                        IFPMP:
                                .IFDF   FPU
                                .WORD   170127          ;LDFPS #1000
                                .WORD   1000
                                .ENDC
000000' 000207                  RTS     PC

                        ;FPU ERROR INTERRUPT ROUTINE
                        ERRFPU:
                                .IFDF   FPU
                                .WORD   170127          ;LDFPS #1000
                                .WORD   1000
                                JMP     @#SERVEC
                                .ENDC

                                .IFNDF  MIN
          000001        CND$37=1
          000001        CND$39=1
          000001        CND$41=1
                                .ENDC

                        ;;;;;;;;;;;;;;;;;;
                        ;FROM HERE ON THIS IS THE SAME AS FPMP.PTX
                        ;;;;;;;;;;;;;;;;;;
                        ;PRODUCT CODE           DEC-11-NFPMA-A-LA
                        ;COMPUTER               PDP-11
                        ;CONFIGURATION          PAPER TAPE CONFIGURATION IS MINIMUM
                        ;                       8192 WORDS MEMORY
                        ;SOFTWARE REQUIREMENTS  PAL-11S (OR MACRO-11)
                        ;                       LINK-11S (OR LINK-11)
                        ;PROGRAM NAME           FPMP-11
                        ;VERSION                VERSION LEVEL   1
                        ;                       PATCH LEVEL     A
                        ;DESCRIPTION            FLOATING POINT MATH PACKAGE
                        ;                       PLUS TRAP HANDLER
                        ;                       (FLOATING POINT SUBROUTINES TAKEN FROM
                        ;                       DOS-11 FORTRAN IV OTS)
                        ;AUTHOR                 E. PETERS (TRAP HANDLER & PACKAGE
                        ;                                  INTEGRATION)
                        ;DATE                   AUGUST, 1972
                        ;                       COPYRIGHT 1972, DIGITAL EQUIPMENT CORP.;
                        ;                       MAYNARD, MASSACHUSETTS 01754
```

```
                                .CSECT
                                .IFDF   SINGLE
                                CND$2=1
                                CND$3=1
                                CND$4=1
                                CND$6=1
                                CND$18=1
                                CND$20=1
                                CND$36=1
                                CND$37=1
                                CND$38=1
                                CND$39=1
                                CND$41=1
                                CND$44=1
                                CND$46=1
                                .ENDC
                                .IFDF   DOUBLE
                                CND$1=1
                                CND$5=1
                                CND$12=1
                                CND$13=1
                                CND$14=1
                                CND$15=1
                                CND$16=1
                                CND$19=1
                                CND$28=1
                                CND$45=1
                                CND$47=1
                                .ENDC
                                .IFDF   SINGLE!DOUBLE
                                CND$8=1
                                CND$9=1
                                CND$31=1
                                CND$42=1
                                .ENDC
                                .IFDF   CND$38
                                CND$2=1
                                CND$18=1
                                CND$20=1
                                CND$21=1
                                CND$38=1
                                CND$32=1
                                .ENDC
                                .IFNDF  FPU
                                .IFDF   CND$3!CND$20!CND$37!CND$39
        000001                  CND$2=1
        000001                  CND$18=1
        000001                  CND$38=1
                                .IFDF   CND$37
        000001                  CND$4=1
                                .ENDC
                                .ENDC
                                .IFDF   CND$10!CND$13!CND$15!CND$19
                                CND$1=1
                                CND$16=1
```

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```
                                CND$28=1
                                CND$33=1
                                .IFDF   CND$13
                                CND$11=1
                                .ENDC
                                .ENDC
                                .IFDF   CND$3!CND$10
        000001                  CND$27=1
                                .ENDC
                                .IFDF   CND$19!CND$20
        000001                  CND$27=1
        000001                  CND$35=1
                                .ENDC
                                .IFDF   CND$14
                                CND$1=1
                                CND$16=1
                                .ENDC
                                .IFDF   CND$41
        000001                  CND$2=1
        000001                  CND$18=1
                                .ENDC
                                .ENDC
                                .IFDF   CND$23
                                CND$27=1
                                CND$33=1
                                .ENDC
                                .IFDF   CND$22!CND$26
                                CND$35=1
                                .ENDC
                                .IFDF   CND$39
        000001                  CND$33=1
                                .ENDC
                                .TITLE  TRAP02
                                .IFDF   CND$42
                                .GLOBL  TRAPH;$ERRA
                                R0=%0
                                R1=%1
                                R2=%2
                                R3=%3
                                R4=%4
                                R5=%5
                                SP=%6
                                PC=%7
                        TRAPH:  BIC     #17,2(SP)
                                CLR     -(SP)
                                MOV     R5,-(SP)
                                MOV     R4,-(SP)
                                MOV     R3,-(SP)
                                MOV     R2,-(SP)
                                MOV     R1,-(SP)
                                MOV     R0,-(SP)
                                MOV     20(SP),R3
                                BIC     #20,R3
                                MOV     R3,@#177776
                                MOV     16(SP),R1
```

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```
                        MOV     R1,R5
                        MOV     -(R1),R4
                        MOV     R4,R3
                        BIC     #177700,R4
                        ASL     R4
                        MOV     TBL$42(R4),R4
                        BEQ     ERR$42
                        MOV     R4,R2
                        BIC     #140000,R2
                        ADD     PC,R2
PTS42:                  BIT     #40000,R4
                        BEQ     NADS42
                        ROLB    R3
                        BPL     PLM$42
                        BCC     STK$42
                        MOV     R5,R0
                        ADD     (R5)+,R0
UPC$42:                 MOV     R5,16(SP)
STK$42:                 MOV     #FAC$42+6,R5
                        TST     R4
                        BLT     ST4$42
                        CLR     -(R5)
                        CLR     -(R5)
                        TST     (R5)+
ST4$42:                 MOV     -(R5),-(SP)
                        MOV     -(R5),-(SP)
                        MOV     -(R5),-(SP)
                        TST     R4
                        BLT     ST6$42
                        CMP     (R0)+,(R0)+
                        BR      OT2$42
ST6$42:                 ADD     #8.,R0
                        MOV     -(R0),-(SP)
                        MOV     -(R0),-(SP)
OT2$42:                 MOV     -(R0),-(SP)
                        MOV     -(R0),-(SP)
                        MOV     #ADR$42,R4
                        JMP     @R2
ADR$42:                 .WORD   .+2
                        MOV     #FAC$42,R5
                        MOV     (SP)+,(R5)+
                        MOV     (SP)+,(R5)+
                        MOV     (SP)+,(R5)+
                        MOV     (SP)+,(R5)+
RET$42:                 MOV     @PC,R0
                        MOV     #FAC$42,R5
                        TST     (R5)+
                        BLT     NEG$42
                        BGT     PLS$42
                        TST     (R5)+
                        BNE     PLS$42
                        TST     (R5)+
                        BNE     PLS$42
                        TST     (R5)+
```

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```
                        BNE     PLS$42
                        CLR     R0
NEG$42:                 NEG     R0
CMP$42:                 BIS     #177776,20(SP)
PLS$42:                 TST     R0
CMI$42:                 MOV     (SP)+,R0
                        MOV     (SP)+,R1
                        MOV     (SP)+,R2
                        MOV     (SP)+,R3
                        MOV     (SP)+,R4
                        MOV     (SP)+,R5
                        TST     (SP)+
                        BEQ     RTI$42
                        BPL     RT2$42
                        MOV     (SP)+,6(SP)
                        MOV     (SP)+,6(SP)
                        CMP     (SP)+,(SP)+
                        RTI
RT2$42:                 MOV     (SP)+,2(SP)
                        MOV     (SP)+,2(SP)
RTI$42:                 RTI
NADS42:                 JSR     R5,@R2
                        MOV     (PC)+,R5
                        .WORD   FAC$42
                        MOV     R0,(R5)+
                        MOV     R1,(R5)+
                        MOV     R2,(R5)+
                        MOV     R3,(R5)+
                        BR      RET$42
PLM$42:                 BCC     STM$42
                        MOV     R5,R0
                        TST     R4
                        BGE     PLI$42
                        ADD     #8.,R0
                        BR      UPC$42
PLI$42:                 CMP     (R5)+,(R5)+
                        BR      UPC$42
STM$42:                 MOV     SP,R0
                        ADD     #22,R0
                        INC     14(SP)
                        TST     R4
                        BGE     STK$42
                        NEG     14(SP)
                        BR      STK$42
ERR$42:                 CLR     R0
                        JSR     R5,$ERRA
                        BR      ERR$42
FAC$42:                 .WORD   0,0,0,0
                        .IFDF   CNO$6

CMR$42:                 MOV     #CAR$42,R4
                        JMP     $CMR
CAR$42:                 .WORD   .+2
                        BIS     #177776,24(SP)
                        CMP     (SP)+,(SP)+
```

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```
                                        .R      CM1$42
                                        .ENDC
                                        .IFDF   CND$5
                        CMD$421 MOV     #CAD$42,R4
                                JMP     $CMD
                        CAD$421 .WORD   CMP$42
                                .ENDC
                                PMODE=40000
                                DMODE=100000
                        TBL$421 .WORD   0,0,0,0,0,0,0,0
                                .WORD   0,0
                                .IFDF   CND$2
                                .WORD   $ADR-PT$42+PMODE
                                .WORD   $$BR-PT$42+PMODE
                                .ENDC
                                .IFNDF  CND$2
                                .WORD   0,0
                                .ENDC
                                .IFDF   CND$1
                                .WORD   $ADD-PT$42+PMODE+DMODE
                                .WORD   $$BD-PT$42+PMODE+DMODE
                                .ENDC
                                .IFNDF  CND$1
                                .WORD   0,0
                                .ENDC
                                .IFDF   CND$5
                                .WORD   CMD$42-PT$42+PMODE+DMODE
                                .ENDC
                                .IFNDF  CND$5
                                .WORD   0
                                .ENDC
                                .IFDF   CND$6
                                .WORD   CMR$42-PT$42+PMODE
                                .ENDC
                                .IFNDF  CND$6
                                .WORD   0
                                .ENDC
                                .WORD   0
                                .IFDF   CND$30
                                .WORD   $MLR-PT$42+PMODE
                                .ENDC
                                .IFNDF  CND$30
                                .WORD   0
                                .ENDC
                                .IFDF   CND$20
                                .WORD   $MLD-PT$42+PMODE+DMODE
                                .ENDC
                                .IFNDF  CND$20
                                .WORD   0
                                .ENDC
                                .IFDF   CND$10
                                .WORD   $DVD-PT$42+PMODE+DMODE
                                .ENDC
                                .IFNDF  CND$10
                                .WORD   0
```

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```
                                .ENDC
                                .WORD   0
                                .IFDF   CND$10
                                .WORD   $QVR-PT$42+PMODE
                                .ENDC
                                .IFNDF  CND$10
                                .WORD   0
                                .ENDC
                                .IFDF   CND$4
                                .WORD   AINT-PT$42
                                .ENDC
                                .IFNDF  CND$4
                                .WORD   0
                                .ENDC
                                .WORD   0,0,0,0,0,0,0,0
                                .IFDF   CND$37
                                .WORD   SIN-PT$42,COS-PT$42
                                .ENDC
                                .IFNDF  CND$37
                                .WORD   0,0
                                .ENDC
                                .IFDF   CND$13
                                .WORD   DSIN-PT$42+DMODE
                                .WORD   DCOS-PT$42+DMODE
                                .ENDC
                                .IFNDF  CND$13
                                .WORD   0,0
                                .ENDC
                                .IFDF   CND$39
                                .WORD   ATAN-PT$42
                                .ENDC
                                .IFNDF  CND$39
                                .WORD   0
                                .ENDC
                                .WORD   0
                                .IFDF   CND$15
                                .WORD   DATAN-PT$42+DMODE
                                .ENDC
                                .IFNDF  CND$15
                                .WORD   0
                                .ENDC
                                .WORD   0
                                .IFDF   CND$41
                                .WORD   SQRT-PT$42
                                .ENDC
                                .IFNDF  CND$41
                                .WORD   0
                                .ENDC
                                .IFDF   CND$14
                                .WORD   DSQRT-PT$42+DMODE
                                .ENDC
                                .IFNDF  CND$14
                                .WORD   0
                                .ENDC
                                .IFDF   CND$30
```

389

```
                                        .WORD   TANH-PTS42
                                        .ENDC
                                        .IFNDF  CND$38
                                        .WORD   0
                                        .ENDC
                                        .IFDF   CND$20
                                        .WORD   EXP-PTS42
                                        .ENDC
                                        .IFNDF  CND$20
                                        .WORD   0
                                        .ENDC
                                        .IFDF   CND$17
                                        .WORD   DEXP-PTS42+DMODE
                                        .ENDC
                                        .IFNDF  CND$17
                                        .WORD   0
                                        .ENDC
                                        .IFDF   CND$3
                                        .WORD   ALOG-PTS42
                                        .WORD   ALOG10-PTS42
                                        .ENDC
                                        .IFNDF  CND$3
                                        .WORD   0,0
                                        .ENDC
                                        .IFDF   CND$10
                                        .WORD   DLOG-PTS42+DMODE
                                        .WORD   DLOG10-PTS42+DMODE
                                        .ENDC
                                        .IFNDF  CND$10
                                        .WORD   0,0
                                        .ENDC
                                        .WORD   0,0,0,0,0,0,0,0,0,0
                                        .IFDF   CND$44
                                        .WORD   $LOR-PTS42+PMODE
                                        .ENDC
                                        .IFNDF  CND$44
                                        .WORD   0
                                        .ENDC
                                        .IFDF   CND$45
                                        .WORD   $LOD-PTS42+PMODE+DMODE
                                        .ENDC
                                        .IFNDF  CND$45
                                        .WORD   0
                                        .ENDC
                                        .IFDF   CND$46
                                        .WORD   $STR-PTS42+PMODE
                                        .ENDC
                                        .IFNDF  CND$46
                                        .WORD   0
                                        .ENDC
                                        .IFDF   CND$47
                                        .WORD   $STD-PTS42+PMODE+DMODE
                                        .ENDC
                                        .IFNDF  CND$47
                                        .WORD   0
```

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```
                                        .ENDC
                                        .WORD   0,0,0
                                        .ENDC
                                        .TITLE  $ADD09
                                        .IFDF   CND$1
                                        .GLOBL  $ADD,$SBD,$ERR
                                        R0=%0
                                        R1=%1
                                        R2=%2
                                        R3=%3
                                        R4=%4
                                        R5=%5
                                        SP=%6
                                        PC=%7
                                        A1=6
                                        B1=8.
                                        C1=10.
                                        D1=12.
                                        A2=14.
                                        B2=16.
                                        C2=18.
                                        D2=20.
                                        SIGNS=0.
                                        MQ=177304
                                        NOR=177312
                                        LSH=177314
                                        ASH=177316
                                        F0=%0
$SBD1:                                  ADD     #100000,@SP
                                        .IFDF   FPU
$ADD1:                                  .WORD   170011
                                        .WORD   172420
                                        .WORD   172820
                                        .WORD   174040
                                        JMP     @(R4)+
                                        .ENDC
                                        .IFNDF  FPU
$ADD1:                                  MOV     R4,-(SP)
                                        MOV     R5,-(SP)
                                        CLR     -(SP)
                                        CLR     R4
                                        CLR     R5
                                        ASL     D1(SP)
                                        ROL     C1(SP)
                                        ROL     B1(SP)
                                        ROL     A1(SP)
                                        BISB    A1+1(SP),R4
                                        BEQ     A1ES1
                                        ROLB    @SP
                                        ASL     D2(SP)
                                        ROL     C2(SP)
                                        ROL     B2(SP)
                                        ROL     A2(SP)
                                        BISB    A2+1(SP),R5
                                        BNE     A2NS1
```

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```
                                        RORB    @SP
                                        ROR     A1(SP)
                                        ROR     B1(SP)
                                        ROR     C1(SP)
                                        ROR     D1(SP)
                                        MOV     A1(SP),A2(SP)
                                        MOV     B1(SP),B2(SP)
                                        MOV     C1(SP),C2(SP)
                                        MOV     D1(SP),D2(SP)
                                A1ES1:  TST     (SP)+
                                        JMP     OUTS1
                                A2NS1:  ROLB    SIGNS+1(SP)
                                        MOVB    #1,A2+1(SP)
                                        MOVB    #1,A1+1(SP)
                                        SUB     R4,R5
                                        BGT     EXAS1
                                        MOV     A2(SP),R0
                                        MOV     B2(SP),R1
                                        MOV     C2(SP),R2
                                        MOV     D2(SP),R3
                                        BR      SCKS1
                                EXAS1:  ADD     R5,R4
                                        MOV     A1(SP),R0
                                        MOV     B1(SP),R1
                                        MOV     C1(SP),R2
                                        MOV     D1(SP),R3
                                        MOV     A2(SP),A1(SP)
                                        MOV     B2(SP),B1(SP)
                                        MOV     C2(SP),C1(SP)
                                        MOV     D2(SP),D1(SP)
                                        SWAB    @SP
                                        NEG     R5
                                SCKS1:  CMPB    SIGNS+1(SP),@SP
                                        BEQ     ECKS1
                                        NEG     R3
                                        ADC     R2
                                        ADC     R1
                                        ADC     R0
                                        NEG     R2
                                        ADC     R1
                                        ADC     R0
                                        NEG     R1
                                        ADC     R0
                                        NEG     R0
                                ECKS1:  TST     R5
                                        BEQ     SFDS1
                                SFTS1:  CMP     #-37.,R5
                                        BLE     SFRS1
                                        MOV     A1(SP),R0
                                        MOV     B1(SP),R1
                                        MOV     C1(SP),R2
                                        MOV     D1(SP),R3
                                        BR      NODS1
                                SFRS1:  CMP     #-8.,R5
                                        BLE     SR8S1
```

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```
                                        .IFNDF  MULDIV
                                        CLR     -(SP)
                                        TST     R0
                                        BPL     SF1S1
                                        COM     @SP
                                        .ENDC
                                        .IFDF   MULDIV
                                        TST     R0
                                        .WORD   000740
                                        .ENDC
                                SFIS1:  CMP     #-16.,R5
                                        BLT     S16S1
                                        MOV     R2,R3
                                        MOV     R1,R2
                                        MOV     R0,R1
                                        MOV     @SP,R0
                                        ADD     #16.,R5
                                        BNE     SF1S1
                                        TST     (SP)+
                                        BR      SFDS1
                                        .IFDF   EAE
                                S16S1:  CMP     #-3,R5
                                        BLE     S8AS1
                                        MOV     R4,@SP
                                        MOV     #MQ,R4
                                        MOV     R3,@R4
                                        MOV     R2,-(R4)
                                        MOV     R5,@#LSH
                                        MOV     (R4)+,R2
                                        MOV     @R4,R3
                                        CLR     @R4
                                        MOV     R1,-(R4)
                                        MOV     R5,@#LSH
                                        TST     (R4)+
                                        BIS     @R4,R2
                                        MOV     R1,@R4
                                        MOV     R0,-(R4)
                                        MOV     R5,@#ASH
                                        MOV     (R4)+,R0
                                        MOV     @R4,R1
                                        MOV     (SP)+,R4
                                        BR      SFDS1
                                        .ENDC
                                        .IFNDF  EAE&MULDIV
                                S16S1:  CMP     #-8.,R5
                                        BLE     S8AS1
                                        ADD     #16.,R5
                                SL8S1:  ASL     R3
                                        ROL     R2
                                        ROL     R1
                                        ROL     R0
                                        ROL     @SP
                                        DEC     R5
                                        BGT     SL8S1
                                        MOV     R2,R3
```

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```
                        MOV     R1,R2
                        MOV     R0,R1
                        MOV     (SP)+,R0
                        BR      SFDS1
                        .ENDC
                        .IFDF   MULDIV
                S16S1:: CMP     #-3,R5
                        BLE     S8AS1
                        MOV     R4,@SP
                        MOV     R5,-(SP)
                        MOV     R1,R4
                        .WORD   073005
                        MOV     R2,R5
                        .WORD   073410
                        MOV     R2,R4
                        MOV     R5,R2
                        MOV     R3,R5
                        .WORD   073420
                        MOV     R5,R3
                        MOV     (SP)+,R4
                        BR      SFDS1
                        .ENDC
                S8AS1:: TST     (SP)+
                SR8S1:: ASR     R0
                        ROR     R1
                        ROR     R2
                        ROR     R3
                        INC     R5
                        BLT     SR8S1
                SFDS1:: ADD     D1(SP),R3
                        ADC     R2
                        ADC     R1
                        ADC     R0
                        ADD     C1(SP),R2
                        ADC     R1
                        ADC     R0
                        ADD     B1(SP),R1
                        ADC     R0
                        ADD     A1(SP),R0
                        CMPB    SIGNS+1(SP),@SP
                        BNE     SUBS1
                        BIT     R0,#1000
                        BEQ     NODS1
                        ASR     R0
                        ROR     R1
                        ROR     R2
                        ROR     R3
                        INC     R4
                NODS1:: SWAB    R4
                        BNE     OVFS1
                NFLS1:: BISB    R0,R4
                        ROR     (SP)+
                        ROR     R4
                        ROR     R1
                        ROR     R2
```

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```
                        ROR     R3
                        ADC     R3
                        ADC     R2
                        ADC     R1
                        ADC     R4
                        BVS     OVRS1
                        BCS     OVRS1
                        MOV     R4,A2+0-2(SP)
                        MOV     R1,B2+0-2(SP)
                        MOV     R2,C2+0-2(SP)
                        MOV     R3,D2+0-2(SP)
                OUTS1:: MOV     (SP)+,R5
                        MOV     (SP)+,R4
                        ADD     #0,,SP
                        JMP     @(R4)+
                OVFS1:: TST     (SP)+
                OVRS1:: JSR     R5,$ERR
                        BR      OUTS1
                        .BYTE   3
                        .BYTE   1
                UTSS1:: TST     R4
                        BGT     NODS1
                UNFS1:: JSR     R5,$ERR
                        BR      UNDS1
                        .BYTE   5
                        .BYTE   1
                UNDS1:: CLR     R0
                        CLR     R1
                        CLR     R2
                        CLR     R3
                ZERS1:: CLR     @SP
                        CLR     R4
                        BR      NFLS1
                SUBS1:: TST     R0
                        BGT     BT9S1
                        BEQ     ZTSS1
                        NEG     R3
                        ADC     R2
                        ADC     R1
                        ADC     R0
                        NEG     R2
                        ADC     R1
                        ADC     R0
                        NEG     R1
                        ADC     R0
                        SWAB    @SP
                        NEG     R0
                        BEQ     ZTSS1
                BT9S1::
                        .IFDF   EAE
                        BIT     R0,#740
                        BNE     B9AS1
                        MOV     R4,-(SP)
                        MOV     #40,R4
                        MOV     R1,@R4
```

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```
                                        MOV     R0,-2(R4)
                                        CLR     @#NOR
                                        MOV     @#NOR,-(SP)
                                        SUB     #6,@SP
                                        MOV     R1,@R4
                                        MOV     R0,-(R4)
                                        MOV     @SP,@#LSH
                                        MOV     (R4)+,R0
                                        MOV     @R4,R1
                                        MOV     R2,@R4
                                        CLR     -(R4)
                                        MOV     @SP,@#LSH
                                        BIS     (R4)+,R1
                                        MOV     R3,@R4
                                        MOV     R2,-(R4)
                                        MOV     @SP,@#LSH
                                        MOV     (R4)+,R2
                                        MOV     @R4,R3
                                        SUB     (SP)+,@SP
                                        MOV     (SP)+,R4
                                        BGT     NOD$1
                                        BR      UNF$1
                                        ;ENDC
                                B9A$1:  BIT     R0,#400
                                        BNE     UT$$1
                                        DEC     R4
                                        ASL     R3
                                        ROL     R2
                                        ROL     R1
                                        ROL     R0
                                        BR      B9A$1
                                ZT3$1:  SUB     #8.,R4
                                        TST     R1
                                        BNE     ZT1$1
                                        SUB     #16.,R4
                                        MOV     R2,R1
                                        BNE     ZT2$1
                                        SUB     #16.,R4
                                        TST     R3
                                        BEQ     ZERS1
                                        BISB    R3,R1
                                        SWAB    R1
                                        SWAB    R3
                                        BISB    R3,R0
                                        CLR     R3
                                        BR      BT9$1
                                ZT2$1:  MOV     R3,R2
                                        CLR     R3
                                ZT1$1:  SWAB    R1
                                        BISB    R1,R0
                                        CLRB    R1
                                        SWAB    R2
                                        BISB    R2,R1
                                        CLRB    R2
                                        SWAB    R3
```

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```
                                        BISB    R3,R2
                                        CLRB    R3
                                        BR      BT9$1
                                        ;ENDC
                                        ;ENDC
                                        .TITLE  $ADR04
                                        .IFDF   CND$2
                                        .GLOBL  $ADR,$SBR,$ERR
                        000000          R0=%0
                        000001          R1=%1
                        000002          R2=%2
                        000003          R3=%3
                        000004          R4=%4
                        000005          R5=%5
                        000006          SP=%6
                        000007          PC=%7
                        000000          SIGNS=0
                        000004          A1=4
                        000006          B1=6
                        000010          A2=8.
                        000012          B2=10.
                        177302          AC=177302
                        177304          MQ=177304
                        177312          NOR=177312
                        177316          ASH=177316
                        000000          F0=%0
000002' 062716  100000          $SBR:   ADD     #100000,@SP
                                        .IFDF   FPU
                                $ADR:   .WORD   170001
                                        .WORD   172420
                                        .WORD   172020
                                        .WORD   174040
                                        JMP     @(R4)+
                                        ;ENDC
                                        .IFNDF  FPU
000006' 010446                  $ADR:   MOV     R4,-(SP)
000010' 005046                          CLR     -(SP)
000012' 005002                          CLR     R2
000014' 005003                          CLR     R3
000016' 006366  000006                  ASL     B1(SP)
000022' 006166  000004                  ROL     A1(SP)
000026' 156603  000005                  BISB    A1+1(SP),R3
000032' 001574                          BEQ     OUT$2
000034' 106116                          ROLB    @SP
000036' 006366  000012                  ASL     B2(SP)
000042' 006166  000010                  ROL     A2(SP)
000046' 156602  000011                  BISB    A2+1(SP),R2
000052' 001014                          BNE     A2N$2
000054' 106016                          RORB    @SP
000056' 006066  000004                  ROR     A1(SP)
000062' 006066  000006                  ROR     B1(SP)
000066' 016666  000004  000010          MOV     A1(SP),A2(SP)
000074' 016666  000006  000012          MOV     B1(SP),B2(SP)
000102' 000550                          BR      OUT$2
000104' 106166  000001          A2N$2:  ROLB    SIGNS+1(SP)
```

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```
  835  000110' 112766  000001  000011          MOVB    #1,A2+1(SP)
  836  000116' 112766  000001  000005          MOVB    #1,A1+1(SP)
  837  000124' 160302                          SUB     R3,R2
  838  000126' 003005                          BGT     EXAS2
  839  000130' 016600  000010                  MOV     A2(SP),R0
  840  000134' 016601  000012                  MOV     B2(SP),R1
  841  000140' 000415                          BR      SCKS2
  842  000142' 060203                  EXAS2:  ADD     R2,R3
  843  000144' 016600  000004                  MOV     A1(SP),R0
  844  000150' 016601  000006                  MOV     B1(SP),R1
  845  000154' 016666  000010  000004          MOV     A2(SP),A1(SP)
  846  000162' 016666  000012  000006          MOV     B2(SP),B1(SP)
  847  000170' 000316                          SWAB    @SP
  848  000172' 005402                          NEG     R2
  849  000174' 126616  000001          SCKS2:  CMPB    SIGNS+1(SP),@SP
  850  000200' 001403                          BEQ     ECKS2
  851  000202' 005401                          NEG     R1
  852  000204' 005500                          ADC     R0
  853  000206' 005400                          NEG     R0
  854  000210' 005702                  ECKS2:  TST     R2
  855  000212' 001450                          BEQ     SFDS2
  856  000214' 022702  177747          SFTS2:  CMP     #-25.,R2
  857  000220' 003405                          BLE     SFRS2
  858  000222' 016600  000004                  MOV     A1(SP),R0
  859  000226' 016601  000006                  MOV     B1(SP),R1
  860  000232' 000456                          BR      NODS2
  861                                          .IFDF   EAE
  862                                  SFRS2:  MOV     R1,@#MQ
  863                                          MOV     R0,@#AC
  864                                          MOV     R2,@#ASH
  865                                          MOV     @#MQ,R1
  866                                          MOV     @#AC,R0
  867                                          .ENDC
  868                                          .IFDF   MULDIV
  869                                  SFRS2:  .WORD   073002
  870                                          .ENDC
  871                                          .IFNDF  EAE&MULDIV
  872  000234' 022702  177778          SFRS2:  CMP     #-8.,R2
  873  000240' 003431                          BLE     SFDS2
  874  000242' 005004                          CLR     R4
  875  000244' 005700                          TST     R0
  876  000246' 100001                          BPL     NCPS2
  877  000250' 005104                          COM     R4
  878  000252' 022702  177760          NCPS2:  CMP     #-16.,R2
  879  000256' 002405                          BLT     SRLS2
  880  000260' 010001                          MOV     R0,R1
  881  000262' 010400                          MOV     R4,R0
  882  000264' 062702  000020                  ADD     #16.,R2
  883  000270' 001421                          BEQ     SFDS2
  884  000272' 022702  177770          SRLS2:  CMP     #-8.,R2
  885  000276' 003412                          BLE     SFDS2
  886  000300' 062702  000020                  ADD     #16.,R2
  887  000304' 006301          SFLS2:  ASL     R1
  888  000306' 006100                          ROL     R0
  889  000310' 006104                          ROL     R4
```

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```
  890  000312' 005302                          DEC     R2
  891  000314' 003373                          BGT     SFLS2
  892  000316' 010001                          MOV     R0,R1
  893  000320' 010400                          MOV     R4,R0
  894  000322' 000404                          BR      SFDS2
  895  000324' 006200                  SFBS2:  ASR     R0
  896  000326' 006001                          ROR     R1
  897  000330' 005202                          INC     R2
  898  000332' 002774                          BLT     SFBS2
  899                                          .ENDC
  900  000334' 066600  000004          SFDS2:  ADD     A1(SP),R0
  901  000340' 066601  000006                  ADD     B1(SP),R1
  902  000344' 005500                          ADC     R0
  903  000346' 126616  000001                  CMPB    SIGNS+1(SP),@SP
  904  000352' 001034                          BNE     SUBS2
  905  000354' 030027  001000                  BIT     R0,#1000
  906  000360' 001403                          BEQ     NODS2
  907  000362' 006200                          ASR     R0
  908  000364' 006001                          ROR     R1
  909  000366' 005203                          INC     R3
  910  000370' 000303                  NODS2:  SWAB    R3
  911  000372' 001020                          BNE     OVRS2
  912  000374' 150003                          BISB    R0,R3
  913  000376' 006016                          ROR     @SP
  914  000400' 006003                          ROR     R3
  915  000402' 006001                          ROR     R1
  916  000404' 005501                          ADC     R1
  917  000406' 005503                          ADC     R3
  918  000410' 102411                          BVS     OVRS2
  919  000412' 103410                          BCS     OVRS2
  920  000414' 010366  000010          STRS2:  MOV     R3,A2(SP)
  921  000420' 010166  000012                  MOV     R1,B2(SP)
  922  000424' 005726                  OUTS2:  TST     (SP)+
  923  000426' 012604                          MOV     (SP)+,R4
  924  000430' 022626                          CMP     (SP)+,(SP)+
  925  000432' 000134                          JMP     @(R4)+
  926  000434' 004567  003000          OVRS2:  JSR     R5,$EMR
  927  000440' 000771                          BR      OUTS2
  928  000442'     003                         .BYTE   3
  929  000443'     002                         .BYTE   2
  930  000444' 005700                  SUBS2:  TST     R0
  931  000446' 003005                          BGT     BT9S2
  932  000450' 001413                          BEQ     ZTSS2
  933  000452' 005400                          NEG     R0
  934  000454' 005401                          NEG     R1
  935  000456' 005600                          SBC     R0
  936  000460' 000316                          SWAB    @SP
  937                                  BT9S2:
  938                                          .IFDF   EAE
  939                                          BIT     R0,#700
  940                                          BNE     BTAS2
  941                                          MOV     R1,@#MQ
  942                                          MOV     R0,@#AC
  943                                          CLR     @#NOR
  944                                          SUB     @#NOR,R3
```

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```
                                        MOV     #-4,@#ASH
                                        ADD     #0,R3
                                        BLE     UNFS2
                                        MOV     @#AC,R0
                                        MOV     @#MQ,R1
                                        BR      NODS2
                                        .ENDC
000462' 030027  000400          B9AS2:  BIT     R0,#400
000466' 001014                          BNE     UTSS2
000470' 005303                          DEC     R3
000472' 006301                          ASL     R1
000474' 006100                          ROL     R0
000476' 000771                          BR      B9AS2
000500' 005701                  ZTSS2:  TST     R1
                                        .IFDF   EAE
                                        BNE     BT9S2
                                        BR      ZERS2
                                        .ENDC
                                        .IFNDF  EAE
000502' 001415                          BEQ     ZERS2
000504' 000301                          SWAB    R1
000506' 150100                          BISB    R1,R0
000510' 105001                          CLRB    R1
000512' 162703  000010                  SUB     #8.,R3
000516' 000761                          BR      BT9S2
                                        .ENDC
000520' 005703                  UTSS2:  TST     R3
000522' 003322                          BGT     NODS2
000524' 004567  003518          UNFS2:  JSR     R5,$EMR
000530' 000401                          BR      UNDS2
000532'     005                         .BYTE   5
000533'     002                         .BYTE   2
000534' 005001                  UNDS2:  CLR     R1
000536' 005003                  ZERS2:  CLR     R3
000540' 000725                          BR      STRS2
                                        .ENDC
                                        .ENDC
                                        .EOT
```

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```
                                ;                               BASIC SOURCE FILE #10
                                        .TITLE  $ALG03
                                        .IFDF   CND$3
                                        .GLOBL  $ERR,ALOG
                                        .IFNDF  $BAS
                                        .GLOBL  ALOG10
                                        .ENDC
                                        .IFNDF  FPU
                                        .GLOBL  $POLSH,$ADR,$SBR,$MLR,$DVR,$IR
                                        .ENDC
                000000                  R0=%0
                000001                  R1=%1
                000002                  R2=%2
                000003                  R3=%3
                000004                  R4=%4
                000005                  R5=%5
                000006                  SP=%6
                000007                  PC=%7
                000000                  F0=%0
                000001                  F1=%1
                000002                  F2=%2
                000003                  F3=%3
                                        .IFNDF  FPU
                                        .IFNDF  $BAS
                                ALOG10: MOV     @PC,-(SP)
                                        BR      LOG$3
                                        .ENDC
000542' 005046                  ALOG:   CLR     -(SP)
000544' 016504  000002          LOG$3:  MOV     2(R5),R4
000550' 012746  071030                  MOV     #071030,-(SP)
000554' 012746  137661                  MOV     #137661,-(SP)
000560' 024646                          CMP     -(SP),-(SP)
000562' 016446  000002                  MOV     2(R4),-(SP)
000566' 011446                          MOV     @R4,-(SP)
000570' 003534                          BLE     ERR$3
000572' 006316                          ASL     @SP
000574' 116666  000001  000014          MOVB    1(SP),12.(SP)
000602' 112766  000200  000001          MOVB    #200,1(SP)
000610' 006016                          ROR     @SP
000612' 012746  002363                  MOV     #002363,-(SP)
000616' 012746  040865                  MOV     #040865,-(SP)
000622' 016646  000006                  MOV     6(SP),-(SP)
000626' 016646  000006                  MOV     6(SP),-(SP)
000632' 012746  002363                  MOV     #002363,-(SP)
000636' 012746  040865                  MOV     #040865,-(SP)
000642' 004467  003238                  JSR     R4,$POLSH
000646' 000002' 000760' 000006'         .WORD   $$BR,UP$3,$ADR,$DVR
000654' 001234'
                                ;
000656' 001006' 001006'                 .WORD   DUP$3,DUP$3
000662' 002322' 000734' 000746'         .WORD   $MLR,REG$3,$TK$3,$TK$3,$TK$3
000670' 000746' 000746'
000674' 002322' 000006' 002322'         .WORD   $MLR,$ADR,$MLR,$ADR,$MLR,$ADR,$MLR,$ADR
```

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```
        000702' 000006' 002322' 000006'
        000710' 002322' 000006'
  1037
  1038  000714' 000772' 002236' 001020'          .WORD   SGLS3,SIR,PL2S3,SMLR
        000722' 002322'
  1039  000724' 000006' 001032'                   .WORD   SADR,EXIS3
  1040
  1041  000730' 002322' 001032'                   .WORD   SMLR,EXIS3
  1042  000734' 012600                    REGS3:  MOV     (SP)+,R0
  1043  000736' 012601                            MOV     (SP)+,R1
  1044  000740' 012702  001110'                   MOV     #CONS3+4,R2
  1045  000744' 000402                            BR      STCS3
  1046  000746' 010146                    STKS3:  MOV     R1,-(SP)
  1047  000750' 010046                            MOV     R0,-(SP)
  1048  000752' 014246                    STCS3:  MOV     -(R2),-(SP)
  1049  000754' 014246                            MOV     -(R2),-(SP)
  1050  000756' 000134                            JMP     @(R4)+
  1051  000760' 012666  000012            UPS3:   MOV     (SP)+,10(SP)
  1052  000764' 012666  000012                    MOV     (SP)+,12(SP)
  1053  000770' 000134                            JMP     @(R4)+
  1054  000772' 005046                    SGLS3:  CLR     -(SP)
  1055  000774' 156616  000006                    BISB    6(SP),@SP
  1056  001000' 162716  000200                    SUB     #200,@SP
  1057  001004' 000134                            JMP     @(R4)+
  1058  001006' 016646  000002            DUPS3:  MOV     2(SP),-(SP)
  1059  001012' 016646  000002                    MOV     2(SP),-(SP)
  1060  001016' 000134                            JMP     @(R4)+
  1061  001020' 012746  071030            PL2S3:  MOV     #071030,-(SP)
  1062  001024' 012746  040061                    MOV     #040061,-(SP)
  1063  001030' 000134                            JMP     @(R4)+
  1064  001032' 105366  000005            EXIS3:  DECB    5(SP)
  1065  001036' 002405                            BLT     LGTS3
  1066  001040' 012746  055731                    MOV     #055731,-(SP)
  1067  001044' 012746  037736                    MOV     #037736,-(SP)
  1068  001050' 000134                            JMP     @(R4)+
  1069  001052' 012600                    LGTS3:  MOV     (SP)+,R0
  1070  001054' 012601                            MOV     (SP)+,R1
  1071  001056' 005726                            TST     (SP)+
  1072  001060' 000205                            RTS     R5
  1073  001062' 062706  000016            ERRS3:  ADD     #14,,SP
  1074  001066' 004567  003140                    JSR     R5,$ERR
  1075  001072' 000205                            RTS     R5
  1076  001074'    004                            .BYTE   4
  1077  001075'    012                            .BYTE   10.
  1078                                            .ENDC
  1079                                            .IFDF   FPU
  1080
  1081                                            .IFNDF  $BAS
  1082                              ALOG10: MOV     @FC,R4
  1083                                      BR      LOGS3
  1084                                      .ENDC
  1085
  1086                              ALOG:   CLR     R4
  1087                              LOGS3:  SETF
  1088                                      SETI
```

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```
  1089                                            MOV     #FCOS3,R0
  1090                                            LDF     @2(R5),F2
  1091                                            CFCC
  1092                                            BLE     ERRS3
  1093                                            STEXP   F2,R1
  1094                                            LDCIF   R1,F3
  1095                                            MULF    (R0)+,F3
  1096                                            LDEXP   #0,F2
  1097                                            LDF     F2,F1
  1098                                            SUBF    (R0),F2
  1099                                            ADDF    (R0)+,F1
  1100                                            DIVF    F1,F2
  1101                                            LDF     F2,F1
  1102                                            MULF    F1,F1
  1103                                            MOV     #3,R1
  1104                                            LDF     (R0)+,F0
  1105                              XPOS3:  MULF  F1,F0
  1106                                      DEC   R1
  1107                                      ADDF  (R0)+,F0
  1108                                      BGT   XPOS3
  1109                                      MULF  F2,F0
  1110                                      ADDF  (R0)+,F0
  1111                                      ADDF  F3,F0
  1112                                      TST   R4
  1113                                      BEQ   LGTS3
  1114                                      MULF  (R0)+,F0
  1115                              LGTS3:  STF   F0,-(SP)
  1116                                      MOV   (SP)+,R0
  1117                                      MOV   (SP)+,R1
  1118                                      RTS   R5
  1119                              ERRS3:  JSR   R5,$ERR
  1120                                      RTS   R5
  1121                                      .BYTE 4
  1122                                      .BYTE 10.
  1123                              FCOS3:  .WORD 040061,071030
  1124                                      .WORD 040065,002363
  1125                                      .ENDC
  1126  001076' 037632  014525             .WORD 037632,014525
  1127  001102' 037714  120036             .WORD 037714,120036
  1128  001106' 040052  125332             .WORD 040052,125332
  1129  001112' 040400  000000     CONS3:  .WORD 040400,000000
  1130                                      .IFDF FPU
  1131                                      .WORD 137661,071030
  1132                                      .WORD 037736,055731
  1133                                      .ENDC
  1134                                      .ENDC
  1135                                      .TITLE  $ANT03
  1136                                      .IFDF   CNO$4
  1137                                      .GLOBL  AINT,$INTR
  1138          000000                      R0=%0
  1139          000001                      R1=%1
  1140          000002                      R2=%2
  1141          000003                      R3=%3
  1142          000004                      R4=%4
  1143          000005                      R5=%5
```

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```
1144                 000006                         SP=%6
1145                 000007                         PC=%7
1146                 177304                         MQ=177304
1147                 177314                         LSH=177314
1148                 000000                         F0=%0
1149                 000001                         F1=%1
1150                                                ,IFDF   FPU
1151
1152                                                ,IFNDF  SBAS
1153                                        AINT1   ,WORD   170001
1154                                                ,WORD   172475,2
1155                                                ,WORD   171467,24
1156                                                ,WORD   174140
1157                                                MOV     (SP)+,R0
1158                                                MOV     (SP)+,R1
1159                                                RTS     R5
1160                                                ,ENDC
1161
1162                                        SINTR1  ,WORD   170001
1163                                                ,WORD   172420
1164                                                ,WORD   171467,4
1165                                                ,WORD   174140
1166                                                JMP     @(R4)+
1167                                        ONES41  ,WORD   000200,0
1168                                                ,ENDC
1169                                                ,IFNDF  FPU
1170 001116' 016504 000002            AINT1   MOV     2(R5),R4
1171 001122' 011400                            MOV     @R4,R0
1172 001124' 016401 000002                     MOV     2(R4),R1
1173 001130' 010702                            MOV     PC,R2
1174 001132' 000403                            BR      AI1S4
1175 001134' 005002                    SINTR1  CLR     R2
1176 001136' 012600                            MOV     (SP)+,R0
1177 001140' 012601                            MOV     (SP)+,R1
1178 001142' 010003                    AI1S4   MOV     R0,R3
1179 001144' 006103                            ROL     R3
1180 001146' 105003                            CLRB    R3
1181 001150' 000303                            SWAB    R3
1182 001152' 162703 000230                     SUB     #230,R3
1183 001156' 002020                            BGE     ONES4
1184 001160' 022703 177750                     CMP     #-30,R3
1185 001164' 002403                            BLT     SHFS4
1186 001166' 005000                            CLR     R0
1187 001170' 005001                            CLR     R1
1188 001172' 000412                            BR      ONES4
1189 001174' 010346                    SHFS41  MOV     R3,-(SP)
1190                                            ,IFNDF  EAE&MULDIV
1191 001176' 006000                    RORS41  ROR     R0
1192 001200' 006001                            ROR     R1
1193 001202' 005203                            INC     R3
1194 001204' 002774                            BLT     RORS4
1195 001206' 012603                            MOV     (SP)+,R3
1196 001210' 006301                    ASLS41  ASL     R1
1197 001212' 006100                            ROL     R0
1198 001214' 005203                            INC     R3
```

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```
1199 001216' 002774                            BLT     ASLS4
1200                                            ,ENDC
1201                                            ,IFDF   EAE
1202                                            MOV     #MQ,R3
1203                                            MOV     R1,@R3
1204                                            MOV     R0,-(R3)
1205                                            MOV     #SP,@#LSH
1206                                            NEG     @SP
1207                                            MOV     (SP)+,@#LSH
1208                                            MOV     (R3)+,R0
1209                                            MOV     @R3,R1
1210                                            ,ENDC
1211                                            ,IFDF   MULDIV
1212                                            ,WORD   073010
1213                                            NEG     @SP
1214                                            ,WORD   073020
1215                                            ,ENDC
1216 001220' 005702                    ONES41  TST     R2
1217 001222' 001401                            BEQ     ON1S4
1218 001224' 000205                            RTS     R5
1219 001226' 010146                    ON1S41  MOV     R1,-(SP)
1220 001230' 010046                            MOV     R0,-(SP)
1221 001232' 000134                            JMP     @(R4)+
1222                                            ,ENDC
1223                                            ,ENDC
1224                                            ,TITLE  SCMD02
1225                                            ,IFDF   CNDS5
1226                                            ,GLOBL  SCMD
1227                                            R0=%0
1228                                            R1=%1
1229                                            R2=%2
1230                                            R4=%4
1231                                            SP=%6
1232                                            PC=%7
1233                                            F0=%0
1234                                            ,IFDF   FPU
1235                                    SCMD1   ,WORD   170011
1236                                            ,WORD   172420
1237                                            ,WORD   173420
1238                                            ,WORD   170000
1239                                            JMP     @(R4)+
1240                                            ,ENDC
1241                                            ,IFNDF  FPU
1242                                    SCMD1   MOV     @PC,R0
1243                                            MOV     6.(SP),R1
1244                                            BGE     FPS55
1245                                            ASL     R0
1246                                            MOV     (SP)+,R2
1247                                            BLT     SME55
1248                                            BR      NEG55
1249                                    FPS551  MOV     (SP)+,R2
1250                                            BLT     PL055
1251                                    SME551  CMP     R1,R2
1252                                            BNE     OUT55
1253                                            CMP     6.(SP),@SP
```

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```
1254                                    BNE     OUTS5
1255                                    CMP     10.(SP),2(SP)
1256                                    BNE     OUTS5
1257                                    CMP     12.(SP),4(SP)
1258                                    BNE     OUTS5
1259                                    CLR     R0
1260                            OUTS5:  ROR     R0
1261                                    BCS     PLS35
1262                            NEGS5:  NEG     R0
1263                            PLS35:  ADD     #14.,SP
1264                                    TST     R0
1265                                    JMP     @(R4)+
1266                                    .ENDC
1267                                    .ENDC
1268                                    .TITLE  SCMR02
1269                                    .IFDF   CND56
1270                                    .GLOBL  SCMR
1271                                    R0=%0
1272                                    R1=%1
1273                                    R2=%2
1274                                    R4=%4
1275                                    SP=%6
1276                                    PC=%7
1277                                    F0=%0
1278                                    .IFDF   FPU
1279                            SCMR:   .WORD   170001
1280                                    .WORD   172420
1281                                    .WORD   173420
1282                                    .WORD   170000
1283                                    JMP     @(R4)+
1284                                    .ENDC
1285                                    .IFNDF  FPU
1286                            SCMR:   MOV     @#0,R0
1287                                    MOV     4(SP),R1
1288                                    BGE     FPS56
1289                                    ASL     R0
1290                                    MOV     (SP)+,R2
1291                                    BLT     SMES6
1292                                    BR      NEG56
1293                            FPS56:  MOV     (SP)+,R2
1294                                    BLT     PLS56
1295                            SMES6:  CMP     R1,R2
1296                                    BNE     OUTS6
1297                                    CMP     4(SP),@SP
1298                                    BNE     OUTS6
1299                                    CLR     R0
1300                            OUTS6:  ROR     R0
1301                                    BCS     PLS56
1302                            NEGS6:  NEG     R0
1303                            PLS56:  ADD     #6,SP
1304                                    TST     R0
1305                                    JMP     @(R4)+
1306                                    .ENDC
1307                                    .ENDC
1308                                    .TITLE  SDBL02
```

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```
1309                                    .IFDF   CND57
1310
1311                                    .GLOBL  DBLE
1312                                    R0=%0
1313                                    R1=%1
1314                                    R2=%2
1315                                    R3=%3
1316                                    R5=%5
1317                            DBLE:   MOV     2(R5),R2
1318                                    MOV     (R2)+,R0
1319                                    MOV     @R2,R1
1320                                    CLR     R2
1321                                    CLR     R3
1322                                    RTS     R5
1323                                    .ENDC
1324                                    .TITLE  SDCI01
1325                                    .IFDF   CND58
1326                                    .GLOBL  SDCI,SRCI
1327                                    R0=%0
1328                                    R1=%1
1329                                    R2=%2
1330                                    R3=%3
1331                                    R4=%4
1332                                    R5=%5
1333                                    SP=%6
1334                                    PC=%7
1335                            NUMEND=0
1336                            POINTL=2
1337                            DIGITS=4
1338                            BEXP=6
1339                            ESIGN=8.
1340                            SIGN=10.
1341                            EEXP=12.
1342                            P=30.
1343                            D=32.
1344                            ERP=26.
1345                            LENGTH=34.
1346                            TEMP=LENGTH
1347                            RESULT=P
1348                            START=36.
1349                            END=START
1350                            SRCI:   CLR     -(SP)
1351                                    INC     @SP
1352                                    BR      CNV58
1353                            SDCI:   CLR     -(SP)
1354                            CNV58:  MOV     R0,-(SP)
1355                                    MOV     R1,-(SP)
1356                                    MOV     R2,-(SP)
1357                                    MOV     R3,-(SP)
1358                                    MOV     R4,-(SP)
1359                                    MOV     R5,-(SP)
1360                                    CLR     -(SP)
1361                                    CLR     -(SP)
1362                                    CLR     -(SP)
1363                                    MOV     #65.,-(SP)
```

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```
1364                                    MOV     #10.,-(SP)
1365                                    CLR     -(SP)
1366                                    CLR     -(SP)
1367                                    MOV     START(SP),R5
1368                                    ADD     LENGTH(SP),END(SP)
1369                                    CLR     R0
1370                                    CLR     R1
1371                                    CLR     R2
1372                                    CLR     R3
1373                            SCNS8:  MOVB    (R5)+,R4
1374                                    BIC     #177600,R4
1375                                    CMPB    R4,#'
1376                                    BNE     SGS8
1377                                    CMP     R5,START(SP)
1378                                    BLT     SCNS8
1379                                    JMP     ZERS8
1380                            SGS8:   CMPB    R4,#'+
1381                                    BEQ     FLOS8
1382                                    CMPB    R4,#'-
1383                                    BNE     NCKS8
1384                                    INC     SIGN(SP)
1385                                    BR      FLOS8
1386                            NXTS8:  MOVB    (R5)+,R4
1387                                    BIC     #177600,R4
1388                                    CMPB    R4,#'
1389                                    BNE     NCKS8
1390                                    MOV     #'0,R4
1391                            NCKS8:  CMPB    R4,#'0
1392                                    BLT     PCKS8
1393                                    BNE     NNZS8
1394                                    TST     R0
1395                                    BNE     NNZS8
1396                                    TST     R1
1397                                    BNE     NNZS8
1398                                    TST     R2
1399                                    BNE     NNZS8
1400                                    TST     R3
1401                                    BEQ     FLOS8
1402                            NNZS8:  CMPB    R4,#'9
1403                                    BGT     EXCS8
1404                                    DEC     DIGITS(SP)
1405                                    BGE     A2IS8
1406                                    INC     EEXP(SP)
1407                                    BR      FLOS8
1408                            A2IS8:  SUB     #60,R4
1409                                    JSR     PC,MLOS8
1410                                    JSR     PC,LFTS8
1411                                    ADD     R4,R3
1412                                    ADC     R2
1413                                    ADC     R1
1414                                    ADC     R0
1415                            FLOS8:  CMP     R5,END(SP)
1416                                    BLT     NXTS8
1417                                    MOV     R5,@SP
1418                            SCLS8:  TST     R0
```

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```
1419                                    BNE     SCIS8
1420                                    TST     R1
1421                                    BNE     SCIS8
1422                                    TST     R2
1423                                    BNE     SCIS8
1424                                    TST     R3
1425                                    BEQ     ZERS8
1426                            SCIS8:  CMP     @SP,R5
1427                                    BNE     NOPS8
1428                                    SUB     P(SP),EEXP(SP)
1429                            NOPS8:  TST     POINTL(SP)
1430                                    BNE     PNTS8
1431                                    MOV     D(SP),@SP
1432                            PNTS8:  SUB     POINTL(SP),@SP
1433                                    SUB     @SP,EEXP(SP)
1434                                    BGT     MULS8
1435                                    BLT     DIVS8
1436                                    JMP     FLTS8
1437                            MULS8:  CMP     R0,#31462
1438                                    BHI     MOVS8
1439                                    JSR     PC,MLOS8
1440                                    INC     BEXP(SP)
1441                            D10S8:  DEC     EEXP(SP)
1442                                    BGT     MULS8
1443                                    JMP     FLTS8
1444                            MOVS8:  JSR     PC,MOVS8
1445                                    ADD     #3,BEXP(SP)
1446                                    BR      D10S8
1447                            PCKS8:  CMPB    R4,#',
1448                                    BNE     ERRS8
1449                            PTFS8:  TST     POINTL(SP)
1450                                    BNE     ERRS8
1451                                    MOV     R5,POINTL(SP)
1452                                    BR      FLOS8
1453                            ERRS8:  COMB    ERF+1(SP)
1454                            ZERS8:  CLR     R0
1455                                    CLR     R1
1456                                    CLR     R2
1457                                    CLR     R3
1458                                    JMP     STRS8
1459                            EXCS8:  CMPB    R4,#'E
1460                                    BEQ     EXTS8
1461                                    CMPB    R4,#'Q
1462                                    BNE     ERRS8
1463                            EXTS8:  MOV     R5,@SP
1464                                    DEC     @SP
1465                                    MOV     R3,TEMP(SP)
1466                                    CLR     R3
1467                                    CMP     R5,END(SP)
1468                                    BGE     ERRS8
1469                                    MOVB    (R5)+,R4
1470                                    BIC     #177600,R4
1471                                    CMPB    R4,#'+
1472                                    BEQ     EFLS8
1473                                    CMPB    R4,#'-
```

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```
1474                                    BNE     ENM$8
1475                                    INC     ESIGN(SP)
1476                            EF1$8:  CMP     R5,END(SP)
1477                                    BGE     ERR$8
1478                            EF2$8:  MOVB    (R5)+,R4
1479                                    BIC     #177600,R4
1480                            ENM$8:  CMPB    R4,#'
1481                                    BNE     EN1$8
1482                                    MOV     #'0,R4
1483                            EN1$8:  CMPB    R4,#'0
1484                                    BLT     ERR$8
1485                                    CMPB    R4,#'9
1486                                    BGT     ERR$8
1487                                    SUB     #60,R4
1488                                    ASL     R3
1489                                    ADD     R3,R4
1490                                    ASL     R3
1491                                    ASL     R3
1492                                    ADD     R4,R3
1493                                    CMP     R5,END(SP)
1494                                    BLT     EF2$8
1495                                    TST     ESIGN(SP)
1496                                    BEQ     EN2$8
1497                                    NEG     R3
1498                            EN2$8:  ADD     R3,EEXP(SP)
1499                                    MOV     TEMP(SP),R3
1500                                    JMP     SCL$8
1501                            DIV$8:  TST     R0
1502                                    BLT     OV1$8
1503                            OV2$8:  DEC     BEXP(SP)
1504                                    JSR     PC,LFT$8
1505                                    BPL     OV2$8
1506                            OV1$8:  MOV     #16.,R4
1507                                    JSR     PC,RIT$8
1508                                    MOV     R3,-(SP)
1509                                    MOV     R2,-(SP)
1510                                    MOV     R1,-(SP)
1511                                    MOV     R0,-(SP)
1512                            OV3$8:  JSR     PC,RIT$8
1513                                    CLC
1514                                    JSR     PC,RIT$8
1515                                    MOV     #2,R5
1516                                    CLC
1517                            OV4$8:  JSR     PC,RIT$8
1518                                    ADD     6(SP),R3
1519                                    ADC     R2
1520                                    ADC     R1
1521                                    ADC     R0
1522                                    ADD     4(SP),R2
1523                                    ADC     R1
1524                                    ADC     R0
1525                                    ADD     2(SP),R1
1526                                    ADC     R0
1527                                    ADD     @SP,R0
1528                                    DEC     R5
```

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```
1529                                    BGT     OV4$8
1530                                    DEC     R4
1531                                    BGT     OV3$8
1532                                    ADD     #8.,SP
1533                                    SUB     #3,BEXP(SP)
1534                                    INC     EEXP(SP)
1535                                    BLT     DIV$8
1536                            FLT$8:  DEC     BEXP(SP)
1537                                    JSR     PC,LFT$8
1538                                    BCC     FLT$8
1539                                    ADD     #200,BEXP(SP)
1540                                    BLE     UND$8
1541                                    CMP     BEXP(SP),#377
1542                                    BGT     OVR$8
1543                                    CLRB    R3
1544                                    BISB    R2,R3
1545                                    SWAB    R3
1546                                    CLRB    R2
1547                                    BISB    R1,R2
1548                                    SWAB    R2
1549                                    CLRB    R1
1550                                    BISB    R0,R1
1551                                    SWAB    R1
1552                                    CLRB    R0
1553                                    BISB    BEXP(SP),R0
1554                                    SWAB    R0
1555                                    ROR     SIGN(SP)
1556                                    JSR     PC,RIT$8
1557                                    ADC     R3
1558                                    ADC     R2
1559                                    ADC     R1
1560                                    ADC     R0
1561                                    BVS     OVR$8
1562                                    BCS     OVR$8
1563                            STR$8:  TSTB    ERF(SP)
1564                                    BEQ     DPR$8
1565                                    ROL     R2
1566                                    ADC     R1
1567                                    ADC     R0
1568                                    BVS     OVR$8
1569                                    BCS     OVR$8
1570                                    MOV     R0,R2
1571                                    MOV     R1,R3
1572                            DPR$8:  MOV     R0,RESULT(SP)
1573                                    MOV     R1,RESULT+2(SP)
1574                                    MOV     R2,RESULT+4(SP)
1575                                    MOV     R3,RESULT+6(SP)
1576                                    ADD     #14.,SP
1577                                    MOV     (SP)+,R5
1578                                    MOV     (SP)+,R4
1579                                    MOV     (SP)+,R3
1580                                    MOV     (SP)+,R2
1581                                    MOV     (SP)+,R1
1582                                    MOV     (SP)+,R0
1583                                    TSTB    @SP
```

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```
1584                                    BEQ     RRNS8
1585                                    MOV     (SP)+,2(SP)
1586                                    MOV     (SP)+,2(SP)
1587                            RRNS8:  ROL     (SP)+
1588                                    RTS     PC
1589                            OVRS8:
1590                            UNDS8:  JMP     ERRS8
1591                            M54S8:  CMP     R0,#144314
1592                                    BLO     M55S8
1593                                    CLC
1594                                    JSR     PC,RIIS8
1595                                    INC     BEXP+0@2(SP)
1596                            M55S8:  MOV     R0,-(SP)
1597                                    MOV     R1,-(SP)
1598                                    MOV     R2,-(SP)
1599                                    MOV     R3,-(SP)
1600                                    CLC
1601                                    JSR     PC,RIIS8
1602                                    CLC
1603                                    JSR     PC,RIIS8
1604                                    BR      M5AS8
1605                            ML9S8:  MOV     R0,-(SP)
1606                                    MOV     R1,-(SP)
1607                                    MOV     R2,-(SP)
1608                                    MOV     R3,-(SP)
1609                                    JSR     PC,LFTS8
1610                                    JSR     PC,LFTS8
1611                            M5AS8:  ADD     (SP)+,R3
1612                                    ADC     R2
1613                                    ADC     R1
1614                                    ADC     R0
1615                                    ADD     (SP)+,R2
1616                                    ADC     R1
1617                                    ADC     R0
1618                                    ADD     (SP)+,R1
1619                                    ADC     R0
1620                                    ADD     (SP)+,R0
1621                                    RTS     PC
1622                            LFTS8:  ASL     R3
1623                                    ROL     R2
1624                                    ROL     R1
1625                                    ROL     R0
1626                                    RTS     PC
1627                            RIIS8:  ROR     R0
1628                                    ROR     R1
1629                                    ROR     R2
1630                                    ROR     R3
1631                                    RTS     PC
1632                                    .ENDC
1633                                    .TITLE  SDC004
1634                                    .IFDF   CND$9
1635
1636                                    .GLOBL  $ECO,$FCO,$GCO,$NCO
1637                                    R0=%0
1638                                    R1=%1
```

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```
1639                                    R2=%2
1640                                    R3=%3
1641                                    R4=%4
1642                                    R5=%5
1643                                    SP=%6
1644                                    PC=%7
1645                            POINT=2
1646                            BEXP=4
1647                            EEXP=6
1648                            TYPE=12.
1649                            P=14.
1650                            D=18.
1651                            L=20.
1652                            S=22.
1653                            $GCO:   MOV     #42403,R0
1654                                    BR      XCO$9
1655                            $FCO:   CLR     R0
1656                                    BR      XCO$9
1657                            $DCO:   MOV     (SP)+,R0
1658                                    MOV     (SP)+,R1
1659                                    MOV     (SP)+,R2
1660                                    MOV     @SP,R3
1661                                    MOV     #42002,@SP
1662                                    MOV     R4,-(SP)
1663                                    MOV     4(SP),R4
1664                                    MOV     R0,4(SP)
1665                                    BR      XC1$9
1666                            $ECO:   MOV     #42402,R0
1667                            XCO$9:  MOV     (SP)+,R3
1668                                    MOV     (SP)+,R1
1669                                    MOV     (SP)+,R2
1670                                    MOV     R3,-(SP)
1671                                    MOV     R0,-(SP)
1672                                    CLR     R3
1673                                    MOV     R4,-(SP)
1674                                    CLR     R4
1675                            XC1$9:  MOV     R5,-(SP)
1676                                    CLR     -(SP)
1677                                    CLR     -(SP)
1678                                    CMP     -(SP),-(SP)
1679                                    ADD     S(SP),L(SP)
1680                                    MOV     S(SP),R0
1681                            CLE$9:  MOVB    #' ,(R0)+
1682                                    CMP     R0,L(SP)
1683                                    BLO     CLE$9
1684                                    ROL     R1
1685                                    ROL     @SP
1686                                    SWAB    R1
1687                                    MOVB    R1,BEXP(SP)
1688                                    BNE     NNZ$9
1689                                    CLR     R0
1690                                    BR      NOD$9
1691                            NNZ$9:  SEC
1692                                    ROR     R1
1693                                    CLRB    R1
```

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```
1694                                    SWAB    R2
1695                                    BISB    R2,R1
1696                                    CLRB    R2
1697                                    SWAB    R3
1698                                    BISB    R3,R2
1699                                    CLRB    R3
1700                                    SWAB    R4
1701                                    BISB    R4,R3
1702                                    CLRB    R4
1703                                    SUB     #200,BEXP(SP)
1704                                    BLT     DIV$9
1705                                    BEQ     NOM$9
1706                            MUL$9:  TST     R1
1707                                    BLT     ML1$9
1708                                    ASL     R4
1709                                    ROL     R3
1710                                    ROL     R2
1711                                    ROL     R1
1712                                    DEC     BEXP(SP)
1713                                    BGT     MUL$9
1714                                    BR      NOM$9
1715                            ML1$9:  JSR     PC,M49$9
1716                                    INC     EEXP(SP)
1717                                    SUB     #3,BEXP(SP)
1718                                    BGT     MUL$9
1719                                    BEQ     NOM$9
1720                            DIV$9:  CMP     R1,#146314
1721                                    BHIS    DV1$9
1722                                    CMP     BEXP(SP),#-3
1723                                    BGT     DV1$9
1724                                    JSR     PC,M54$9
1725                                    DEC     EEXP(SP)
1726                                    ADD     #2,BEXP(SP)
1727                                    BR      DV2$9
1728                            DV1$9:  JSR     PC,RIT$9
1729                            DV2$9:  INC     BEXP(SP)
1730                                    BNE     DIV$9
1731                            NOM$9:  CLR     R0
1732                            NO1$9:  JSR     PC,M54$9
1733                                    JSR     PC,ML0$9
1734                                    TST     R0
1735                                    BNE     NOD$9
1736                                    DEC     EEXP(SP)
1737                                    BR      NO1$9
1738                            NOD$9:  TSTB    TYPE(SP)
1739                                    BEQ     FFT$9
1740                                    RORB    TYPE(SP)
1741                                    BCC     EFT$9
1742                                    TST     EEXP(SP)
1743                                    BLT     EFT$9
1744                                    CMP     EEXP(SP),D(SP)
1745                                    BGT     EFT$9
1746                                    CLRB    TYPE(SP)
1747                                    SUB     #4,L(SP)
1748                                    SUB     EEXP(SP),D(SP)
```

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```
1749                                    CLR     P(SP)
1750                            FFT$9:  MOV     EEXP(SP),R5
1751                            FFE$9:  ADD     D(SP),R5
1752                                    ADD     P(SP),R5
1753                                    JSR     PC,RUD$9
1754                                    MOV     L(SP),R5
1755                                    SUB     D(SP),R5
1756                                    TSTB    TYPE(SP)
1757                                    BNE     FF5$9
1758                                    ADD     EEXP(SP),P(SP)
1759                                    BLE     FF5$9
1760                                    SUB     P(SP),R5
1761                                    SUB     #2,R5
1762                                    JSR     PC,ISN$9
1763                                    BR      FF3$9
1764                            FF5$9:  SUB     #3,R5
1765                                    JSR     PC,ISN$9
1766                                    MOVB    #'0,(R5)+
1767                                    MOVB    #'.,(R5)+
1768                            FF4$9:  CMP     R5,L(SP)
1769                                    BHIS    FF3$9
1770                                    MOVB    #'0,(R5)+
1771                                    BR      FF4$9
1772                            FF3$9:  MOV     L(SP),R5
1773                                    SUB     D(SP),R5
1774                                    DEC     R5
1775                                    MOV     R5,POINT(SP)
1776                                    TST     P(SP)
1777                                    BGT     FF6$9
1778                                    INC     R5
1779                            FF6$9:  SUB     P(SP),R5
1780                                    JSR     PC,DGT$9
1781                                    TSTB    TYPE(SP)
1782                                    BEQ     ONE$9
1783                                    BR      EFE$9
1784                            ED1$9:  SUB     #4,L(SP)
1785                                    CLR     R5
1786                                    TST     P(SP)
1787                                    BLE     FFE$9
1788                                    MOV     D(SP),R5
1789                                    ADD     P(SP),R5
1790                                    JSR     PC,RUD$9
1791                                    MOV     L(SP),R5
1792                                    SUB     D(SP),R5
1793                                    DEC     R5
1794                                    MOV     R5,POINT(SP)
1795                                    SUB     P(SP),R5
1796                                    DEC     R5
1797                                    JSR     PC,ISN$9
1798                                    JSR     PC,DGT$9
1799                            EFE$9:  SUB     P(SP),EEXP(SP)
1800                                    MOV     L(SP),R3
1801                                    MOVB    TYPE+1(SP),(R3)+
1802                                    MOV     EEXP(SP),R4
1803                                    BGE     EXP$9
```

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```
1804                                    NEG     R4
1805                                    MOVB    #1,-(R3)+
1806                                    BR      EX1$9
1807                            EXP$9:  MOVB    #' ,-(R3)+
1808                            EX1$9:  MOVB    #1,@R3
1809                            EX3$9:  SUB     #10.,R4
1810                                    BLT     EX2$9
1811                                    INCB    @R3
1812                                    BR      EX3$9
1813                            EX2$9:  ADD     #72,R4
1814                                    MOVB    R4,1(R3)
1815                            DNE$9:  ADD     #8.,SP
1816                                    MOV     (SP)+,R5
1817                                    MOV     (SP)+,R4
1818                                    MOV     (SP)+,6(SP)
1819                                    MOV     (SP)+,6(SP)
1820                                    CMP     (SP)+,(SP)+
1821                                    ROL     (SP)+
1822                                    RTS     PC
1823                            M54$9:  MOV     R1,-(SP)
1824                                    MOV     R2,-(SP)
1825                                    MOV     R3,-(SP)
1826                                    MOV     R4,-(SP)
1827                                    JSR     PC,RIT$9
1828                                    JSR     PC,RIT$9
1829                                    ADC     R4
1830                                    ADC     R3
1831                                    ADC     R2
1832                                    ADC     R1
1833                                    ADD     (SP)+,R4
1834                                    ADC     R3
1835                                    ADC     R2
1836                                    ADC     R1
1837                                    ADC     R0
1838                                    ADD     (SP)+,R3
1839                                    ADC     R2
1840                                    ADC     R1
1841                                    ADC     R0
1842                                    ADD     (SP)+,R2
1843                                    ADC     R1
1844                                    ADC     R0
1845                                    ADD     (SP)+,R1
1846                                    ADC     R0
1847                                    RTS     PC
1848                            M48$9:  MOV     #16.,R5
1849                                    JSR     PC,RIT$9
1850                                    MOV     R4,-(SP)
1851                                    MOV     R3,-(SP)
1852                                    MOV     R2,-(SP)
1853                                    MOV     R1,-(SP)
1854                            M5I$9:  JSR     PC,RIT$9
1855                                    JSR     PC,RIT$9
1856                                    MOV     #2,R0
1857                            M52$9:  JSR     PC,RIT$9
1858                                    ADD     6(SP),R4
```

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```
1859                                    ADC     R3
1860                                    ADC     R2
1861                                    ADC     R1
1862                                    ADD     4(SP),R3
1863                                    ADC     R2
1864                                    ADC     R1
1865                                    ADD     2(SP),R2
1866                                    ADC     R1
1867                                    ADD     @SP,R1
1868                                    DEC     R0
1869                                    BGT     M52$9
1870                                    DEC     R5
1871                                    BGT     M5I$9
1872                                    ADD     #8.,SP
1873                                    RTS     PC
1874                            ML8$9:  MOV     R5,-(SP)
1875                                    MOV     #3,R5
1876                            M8I$9:  ASL     R4
1877                                    ROL     R3
1878                                    ROL     R2
1879                                    ROL     R1
1880                                    ROL     R0
1881                                    DEC     R5
1882                                    BGT     M8I$9
1883                                    MOV     (SP)+,R5
1884                                    RTS     PC
1885                            ERR$9:  TST     (SP)+
1886                                    MOV     S(SP),R3
1887                                    MOV     L(SP),R4
1888                                    TSTB    TYPE(SP)
1889                                    BEQ     ST$$9
1890                                    ADD     #4,R4
1891                            ST$$9:  MOVB    #'@,(R3)+
1892                                    CMP     R3,R4
1893                                    BLO     ST$$9
1894                                    COM     TYPE(SP)
1895                                    BR      DNE$9
1896                            RUD$9:  CMP     R5,#20.
1897                                    BGT     RU$$9
1898                                    MOV     R5,@EXP+0+2(SP)
1899                                    BEQ     RU3$9
1900                                    BLT     RU1$9
1901                                    MOV     R0,-(SP)
1902                                    MOV     R1,-(SP)
1903                                    MOV     R2,-(SP)
1904                                    MOV     R3,-(SP)
1905                                    MOV     R4,-(SP)
1906                                    MOV     #100000,R1
1907                                    CLR     R2
1908                                    CLR     R3
1909                                    CLR     R4
1910                            RDF$9:  DEC     @EXP+0+2+10.(SP)
1911                                    BEQ     RDD$9
1912                                    JSR     PC,M48$9
1913                                    JSR     PC,RIT$9
```

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```
1914                                    JSR     PC,RITS9
1915                                    JSR     PC,RITS9
1916                                    BR      RQFS9
1917                            RQQS9:  CLR     R0
1918                                    ADD     (SP)+,R4
1919                                    ADC     R3
1920                                    ADC     R2
1921                                    ADC     R1
1922                                    ADD     (SP)+,R3
1923                                    ADC     R2
1924                                    ADC     R1
1925                                    ADD     (SP)+,R2
1926                                    ADC     R1
1927                                    ADD     (SP)+,R1
1928                                    ADC     R0
1929                                    ADD     (SP)+,R0
1930                            RU2S9:  CMP     #10.,R0
1931                                    BGT     RU1S9
1932                                    INC     EEXP+2(SP)
1933                            RU1S9:  RTS     PC
1934                            RU3S9:  ADD     #5,R0
1935                                    BR      RU2S9
1936                            ISNS9:  CMP     R5,S-0+2(SP)
1937                                    BLO     SPCS9
1938                                    ROR     0+2(SP)
1939                                    BCC     ISRS9
1940                                    MOVB    #'-,@R5
1941                            ISRS9:  INC     R5
1942                                    RTS     PC
1943                            SPCS9:  ROR     0+2(SP)
1944                                    BCS     ERRS9
1945                                    INC     R5
1946                                    CMP     R5,S+2(SP)
1947                                    BLO     ERRS9
1948                                    RTS     PC
1949                            DGBS9:  CMP     #10.,R0
1950                                    BGT     DG1S9
1951                                    MOVB    #'1,(R5)+
1952                                    SUB     #10.,R0
1953                            DG1S9:  CMP     POINT+2(SP),R5
1954                                    BNE     DG2S9
1955                                    MOVB    #'.,(R5)+
1956                            DG2S9:  CMP     L+2(SP),R5
1957                                    BLOS    DIGS9
1958                            DG3S9:  ADD     #60,R0
1959                                    MOVB    R0,(R5)+
1960                                    CLR     R0
1961                                    JSR     PC,M54S9
1962                                    JSR     PC,MLBS9
1963                                    BR      DG1S9
1964                            DIGS9:  RTS     PC
1965                            RITS9:  CLC
1966                                    ROR     R1
1967                                    ROR     R2
1968                                    ROR     R3
```



```
1969                                    ROR     R4
1970                                    RTS     PC
1971                                    .ENDC
1972                                    .EOT
1973
```

```
                                    .                                   BASIC SOURCE FILE #11
                                    .TITLE  $QLG03
                                    .IFDF   CNO$10
                                    .GLOBL  DLOG,DLOG10,$ERR
                                    .IFNDF  FPU
                                    .GLOBL  $POLSH,$ADD,$SBD,$MLD,$DVD,$ID,$POPR4
                                    .ENDC
                                    R0=%0
                                    R1=%1
                                    R2=%2
                                    R3=%3
                                    R4=%4
                                    R5=%5
                                    SP=%6
                                    PC=%7
                                    F0=%0
                                    F1=%1
                                    F2=%2
                                    F3=%3
                                    .IFNDF  FPU
                            DLOG10: MOV     @PC,-(SP)
                                    BR      LOG$10
                            DLOG:   CLR     -(SP)
                            LOG$10: MOV     R5,-(SP)
                                    MOV     2(R5),R4
                                    ADD     #8.,R4
                                    MOV     #147572,-(SP)
                                    MOV     #173721,-(SP)
                                    MOV     #071027,-(SP)
                                    MOV     #137601,-(SP)
                                    SUB     #8.,SP
                                    MOV     -(R4),-(SP)
                                    MOV     -(R4),-(SP)
                                    MOV     -(R4),-(SP)
                                    MOV     -(R4),-(SP)
                                    BLE     ERR$10
                                    ASL     @SP
                                    MOVB    1(SP),26.(SP)
                                    MOVB    #200,1(SP)
                                    ROR     @SP
                                    MOV     #157145,-(SP)
                                    MOV     #031771,-(SP)
                                    MOV     #002303,-(SP)
                                    MOV     #040005,-(SP)
                                    MOV     14.(SP),-(SP)
                                    MOV     14.(SP),-(SP)
                                    MOV     14.(SP),-(SP)
                                    MOV     14.(SP),-(SP)
                                    MOV     #157145,-(SP)
                                    MOV     #031771,-(SP)
                                    MOV     #002303,-(SP)
                                    MOV     #040005,-(SP)
                                    JSR     R4,$POLSH
                                    .WORD   $SBD,UPS10,$ADD,$DVD
```

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```
                                    .WORD   DUPS10,DUPS10
                                    .WORD   $MLD
                                    .WORD   $POPR4
                                    .WORD   REG$10
                            XPOS10: .WORD   $MLD,$ADD,$MLD,$ADD,$MLD,$ADD,$MLD,$ADD
                                    .WORD   $MLD,$ADD,$MLD,$ADD,$MLD,$ADD

                                    .WORD   SCL$10,$ID,PL2$10,$MLD
                                    .WORD   $ADD,EXI$10

                                    .WORD   $MLD,EXI$10
                            ERR$10: ADD     #24.,SP
                                    JSR     R5,$ERR
                                    BR      ERO$10
                                    .BYTE   4
                                    .BYTE   3
                            REG$10: MOV     #CON$10+6.,R4
                                    MOV     #7,R5
                                    BR      STC$10
                            STK$10: MOV     R3,-(SP)
                                    MOV     R2,-(SP)
                                    MOV     R1,-(SP)
                                    MOV     R0,-(SP)
                            STC$10: MOV     -(R4),-(SP)
                                    MOV     -(R4),-(SP)
                                    MOV     -(R4),-(SP)
                                    MOV     -(R4),-(SP)
                                    DEC     R5
                                    BGT     STK$10
                                    MOV     #XPOS10,R4
                                    JMP     @(R4)+
                            UPS10:  MOV     (SP)+,22.(SP)
                                    MOV     (SP)+,22.(SP)
                                    MOV     (SP)+,22.(SP)
                                    MOV     (SP)+,22.(SP)
                                    JMP     @(R4)+
                            SCL$10: CLR     -(SP)
                                    BISB    12.(SP),@SP
                                    SUB     #200,@SP
                                    JMP     @(R4)+
                            DUPS10: MOV     6(SP),-(SP)
                                    MOV     6(SP),-(SP)
                                    MOV     6(SP),-(SP)
                                    MOV     6(SP),-(SP)
                                    JMP     @(R4)+
                            PL2S10: MOV     #147572,-(SP)
                                    MOV     #173721,-(SP)
                                    MOV     #071027,-(SP)
                                    MOV     #040001,-(SP)
                                    JMP     @(R4)+
                            EXI$10: DECB    11.(SP)
                                    BLT     LO$10
                                    MOV     #024102,-(SP)
                                    MOV     #124407,-(SP)
                                    MOV     #055730,-(SP)
```

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```
                                        MOV     #037736,-(SP)
                                        JMP     @(R4)+
                                LGTS1$: MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R2
                                        MOV     (SP)+,R3
                                ERRS1$: MOV     (SP)+,R5
                                        TST     (SP)+
                                        RTS     R5
                                        .ENDC
                                        .IFDF   FPU
                                OLOG1$: MOV     @PC,R4
                                        BR      LOGS1$
                                OLOG1:  CLR     R4
                                LOGS1$: SETD
                                        SETI
                                        MOV     #FCOS1$,R0
                                        LDD     @2(R5),F2
                                        CFCC
                                        BLE     ERRS1$
                                        STEXP   F2,R1
                                        LDCID   R1,F3
                                        MULD    (R0)+,F3
                                        LDEXP   #8,F2
                                        LDD     F2,F1
                                        SUBD    (R0),F2
                                        ADDD    (R0)+,F1
                                        DIVD    F1,F2
                                        LDD     F2,F1
                                        MULD    F1,F1
                                        MOV     #6,R1
                                        LDD     (R0)+,F0
                                XPOS1$: MULD    F1,F0
                                        DEC     R1
                                        ADDD    (R0)+,F0
                                        BGT     XPOS1$
                                        MULD    F2,F0
                                        ADDD    (R0)+,F0
                                        ADDD    F3,F0
                                        TST     R4
                                        BEQ     LGTS1$
                                        MULD    (R0),F0
                                LGTS1$: STD     F0,-(SP)
                                        MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R2
                                        MOV     (SP)+,R3
                                        RTS     R5
                                ERRS1$: J$R     R5,$ERR
                                        RTS     R5
                                        .BYTE   4
                                        .BYTE   3
                                FCOS1$: .WORD   040861,071027
                                        .WORD   173721,147572
                                        .WORD   040069,002363
```

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```
                                        .WORD   031771,157145
                                        .ENDC
                                        .WORD   037455,100270
                                        .WORD   137100,174770
                                        .WORD   037471,072731
                                        .WORD   137710,117115
                                        .WORD   037543,111153
                                        .WORD   000101,135465
                                        .WORD   037622,044436
                                        .WORD   007300,063062
                                        .WORD   037714,140314
                                        .WORD   133450,165773
                                        .WORD   040052,125252
                                        .WORD   125247,004643
                                CONS1$: .WORD   040400,000000
                                        .WORD   000000,000057
                                        .IFDF   FPU
                                        .WORD   137661,071027
                                        .WORD   173721,147572
                                        .WORD   037730,055730
                                        .WORD   124467,026162
                                        .ENDC
                                        .ENDC
                                        .TITLE  $DNT02
                                        .IFDF   CND$11
                                        .GLOBL  $DINT
                                        R0=%0
                                        R1=%1
                                        R2=%2
                                        R3=%3
                                        R4=%4
                                        R5=%5
                                        SP=%6
                                        MQ=177304
                                        ASH=177312
                                        F0=%0
                                        F1=%1
                                        .IFDF   FPU
                                $DINT1: .WORD   170011
                                        .WORD   172420
                                        .WORD   171467,4
                                        .WORD   174140
                                        JMP     @(R4)+
                                        .WORD   040200,0,0,0
                                        .ENDC
                                        .IFNDF  FPU
                                $DINT1: MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R2
                                        MOV     (SP)+,R3
                                        MOV     R4,-(SP)
                                        MOV     R5,-(SP)
                                        MOV     R0,R4
                                        ROL     R4
                                        CLR8    R4
```

421

```
2194                                    SWAB    R4
2195                                    SUB     #270,R4
2196                                    BGE     ONES11
2197                                    CMP     #-70,R4
2198                                    BLT     SHFS11
2199                                    CLR     R0
2200                                    CLR     R1
2201                            C23S11: CLR     R2
2202                                    CLR     R3
2203                                    BR      ONES11
2204                            SHFS11:
2205                                    .IFNDF  EAE&MULDIV
2206                                    MOV     R4,R5
2207                                    CMP     #-32.,R4
2208                                    BLT     RORS11
2209                                    BEQ     C23S11
2210                                    ADD     #32.,R4
2211                                    MOV     R4,R5
2212                            RRIS11: ROR     R0
2213                                    ROR     R1
2214                                    INC     R4
2215                                    BLT     RR1S11
2216                            ASIS11: ASL     R1
2217                                    ROL     R0
2218                                    INC     R5
2219                                    BLT     AS1S11
2220                                    BR      C23S11
2221                            RORS11: ROR     R2
2222                                    ROR     R3
2223                                    INC     R4
2224                                    BLT     RORS11
2225                            ASLS11: ASL     R3
2226                                    ROL     R2
2227                                    INC     R5
2228                                    BLT     ASLS11
2229                                    .ENDC
2230                                    .IFDF   EAE
2231                                    MOV     #MQ,R5
2232                                    .ENDC
2233                                    .IFDF   MULDIV!EAE
2234                                    CMP     #-32.,R4
2235                                    BLT     R23S11
2236                                    BEQ     C23S11
2237                            R0IS11: ADD     #32.,R4
2238                                    .IFDF   MULDIV
2239                                    .WORD   073004
2240                                    NEG     R4
2241                                    .WORD   073004
2242                                    .ENDC
2243                                    .IFDF   EAE
2244                                    MOV     R1,@R5
2245                                    MOV     R0,-(R5)
2246                                    MOV     R4,@#ASH
2247                                    NEG     R4
2248                                    MOV     R4,@#ASH
```

422


```
2249                                    MOV     (R5)+,R0
2250                                    MOV     @R5,R1
2251                                    .ENDC
2252                                    BR      C23S11
2253                                    .IFDF   MULDIV
2254                            R23S11: .WORD   073204
2255                                    NEG     R4
2256                                    .WORD   073204
2257                                    .ENDC
2258                                    .IFDF   EAE
2259                            R23S11: MOV     R3,@R5
2260                                    MOV     R2,-(R5)
2261                                    MOV     R4,@#ASH
2262                                    NEG     R4
2263                                    MOV     R4,@#ASH
2264                                    MOV     (R5)+,R2
2265                                    MOV     @R5,R3
2266                                    .ENDC
2267                                    .ENDC
2268                            ONES11: MOV     (SP)+,R5
2269                                    MOV     (SP)+,R4
2270                                    MOV     R3,-(SP)
2271                                    MOV     R2,-(SP)
2272                                    MOV     R1,-(SP)
2273                                    MOV     R0,-(SP)
2274                                    JMP     @(R4)+
2275                                    .ENDC
2276                                    .ENDC
2277                                    .TITLE  $DR02
2278                                    .IFDF   CND$12
2279                                    .GLOBL  $DR,$ERR
2280                                    R4=%4
2281                                    R5=%5
2282                                    SP=%6
2283                                    F0=%8
2284                                    .IFDF   FPU
2285                            $DR:    .WORD   170001
2286                                    .WORD   177420
2287                                    .WORD   170000
2288                                    BVS     OV1S12
2289                                    .WORD   174046
2290                                    JMP     @(R4)+
2291                                    .ENDC
2292                                    .IFNDF  FPU
2293                            $DR:    ROL     4(SP)
2294                                    ADC     2(SP)
2295                                    ADC     @SP
2296                                    BCS     OVRS12
2297                                    BVS     OVRS12
2298                            DR1S12: MOV     (SP)+,2(SP)
2299                                    MOV     (SP)+,2(SP)
2300                                    JMP     @(R4)+
2301                            OVRS12: CMP     (SP)+,(SP)+
2302                                    CMP     (SP)+,(SP)+
2303                                    .ENDC
```

423

```
2304                                    OV$S12: JSR     R5,$EMR
2305                                            BR      OR2$12
2306                                            .BYTE   3
2307                                            .BYTE   23.
2308                                    OR2$12: CLR     -(SP)
2309                                            CLR     -(SP)
2310                                            JMP     @(R4)+
2311                                            .ENDC
2312                                            .TITLE  $OSN04
2313                                            .IFDF   CNO$13
2314
2315                                            .GLOBL  DSIN,QCOS
2316                                            .IFNDF  FPU
2317                                            .GLOBL  $ADD,$SBD,$MLD,$DVD,$DINT,$POLSH,$POPR4
2318                                            .ENDC
2319                                            R0=%0
2320                                            R1=%1
2321                                            R2=%2
2322                                            R3=%3
2323                                            R4=%4
2324                                            R5=%5
2325                                            SP=%6
2326                                            PC=%7
2327                                            F0=%0
2328                                            F1=%1
2329                                            F2=%2
2330                                            F3=%3
2331                                            .IFNDF  FPU
2332                                    QCOS:   MOV     R0,-(SP)
2333                                            MOV     2(R5),R4
2334                                            CLR     -(SP)
2335                                            MOV     6(R4),-(SP)
2336                                            MOV     4(R4),-(SP)
2337                                            MOV     2(R4),-(SP)
2338                                            MOV     @R4,-(SP)
2339                                            MOV     #064302,-(SP)
2340                                            MOV     #121041,-(SP)
2341                                            MOV     #007732,-(SP)
2342                                            MOV     #040311,-(SP)
2343                                            JSR     R4,$POLSH
2344                                            .WORD   $ADD,SNC$13
2345                                    DSIN:   MOV     R5,-(SP)
2346                                            MOV     2(R5),R4
2347                                            CLR     -(SP)
2348                                            MOV     6(R4),-(SP)
2349                                            MOV     4(R4),-(SP)
2350                                            MOV     2(R4),-(SP)
2351                                            MOV     @R4,-(SP)
2352                                    SNC$13: ASL     @SP
2353                                            ROR     0(SP)
2354                                            ROR     @SP
2355                                            MOV     #064302,-(SP)
2356                                            MOV     #121041,-(SP)
2357                                            MOV     #007732,-(SP)
2358                                            MOV     #040711,-(SP)
```

424


```
2359                                            JSR     R4,$POLSH
2360                                            .WORD   $DVD
2361                                            .WORD   DUP$13
2362                                            .WORD   $DINT
2363                                            .WORD   $SBD
2364                                            .WORD   X4$13
2365                                            .WORD   DUP$13
2366                                            .WORD   $DINT
2367                                            .WORD   QUD$13
2368                                            .WORD   $SBD
2369                                            .WORD   QST$13
2370                                    QSE$13: .WORD   DUP$13
2371                                            .WORD   DUP$13
2372                                            .WORD   $MLD
2373                                            .WORD   $POPR4
2374                                            .WORD   PLY$13
2375                                    XPD$13: .WORD   $MLD,$ADD,$MLD,$ADD,$MLD,$ADD,$MLD,$ADD
2376                                            .WORD   $MLD,$ADD,$MLD,$ADD,$MLD,$ADD,$MLD,$ADD
2377                                            .WORD   $MLD
2378                                    PR4$13: .WORD   $POPR4
2379                                            .WORD   RTN$13
2380                                    RTN$13: TST     (SP)+
2381                                            BGE     RTI$13
2382                                            ADD     #100000,R0
2383                                    RTI$13: MOV     (SP)+,R5
2384                                            RTS     R5
2385                                    DUP$13: MOV     6(SP),-(SP)
2386                                            MOV     6(SP),-(SP)
2387                                            MOV     6(SP),-(SP)
2388                                            MOV     6(SP),-(SP)
2389                                            JMP     @(R4)+
2390                                    X4$13:  TST     @SP
2391                                            BEQ     ZER$13
2392                                            INCB    1(SP)
2393                                            JMP     @(R4)+
2394                                    ZER$13: MOV     #PR4$13,R4
2395                                            JMP     @(R4)+
2396                                    QUD$13: BIS     @SP,10(SP)
2397                                            JMP     @(R4)+
2398                                    QST$13: TSTB    0(SP)
2399                                            BEQ     Q13$13
2400                                            ADD     #100000,@SP
2401                                            CLR     -(SP)
2402                                            CLR     -(SP)
2403                                            CLR     -(SP)
2404                                            MOV     #40200,-(SP)
2405                                            JSR     R4,$POLSH
2406                                            .WORD   $ADD,QSR$13
2407                                    QSR$13: MOV     #QSE$13,R4
2408                                    Q13$13: ASRB    9.(SP)
2409                                            BCC     QUT$13
2410                                            ADD     #100000,@SP
2411                                    QUT$13: JMP     @(R4)+
2412                                    PLY$13: MOV     #CON$13+6.,R4
2413                                            MOV     #9.,R5
```

425

```
                                        BR      PY1S13
                                PY2S13: MOV     R3,-(SP)
                                        MOV     R2,-(SP)
                                        MOV     R1,-(SP)
                                        MOV     R0,-(SP)
                                PY1S13: MOV     -(R4),-(SP)
                                        MOV     -(R4),-(SP)
                                        MOV     -(R4),-(SP)
                                        MOV     -(R4),-(SP)
                                        DEC     R5
                                        BGT     PY2S13
                                        MOV     #XPOS13,R4
                                        JMP     @(R4)+
                                        .ENDC
                                        .IFDF   FPU
                                DCOS:   SETD
                                        LDD     @2(R5),F0
                                        ADDD    PI2S13,F0
                                        BR      SNGS13
                                OS1N:   SETD
                                        LDD     @2(R5),F0
                                SNGS13: SETI
                                        MOV     #FCOS13,R0
                                        CLR     R4
                                        CFCC
                                        BGE     POSS13
                                        INC     R4
                                        ABSD    F0
                                POSS13: DIVD    (R0)+,F0
                                        MODD    #1.0,F0
                                        CFCC
                                        BEQ     RTNS13
                                        MODD    #4.0,F0
                                        STCDI   F1,R1
                                        ROR     R1
                                        BCC     Q13S13
                                        NEGD    F0
                                        ADDD    #1.0,F0
                                Q13S13: ROR     R1
                                        BCC     Q12S13
                                        NEGD    F0
                                Q12S13: LDD     F0,F2
                                        MULD    F2,F2
                                        MOV     #8.,R1
                                        LDD     (R0)+,F1
                                XPOS13: MULD    F2,F1
                                        DEC     R1
                                        ADDD    (R0)+,F1
                                        BGT     XPOS13
                                        MULD    F1,F0
                                        TST     R4
                                        BEQ     RTNS13
                                        NEGD    F0
                                RTNS13: STD     F0,-(SP)
                                        MOV     (SP)+,R0
```

426


```
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R2
                                        MOV     (SP)+,R3
                                        RTS     R5
                                PI2S13: .WORD   040311,007732
                                        .WORD   121041,064302
                                FCOS13: .WORD   040711,007732
                                        .WORD   121041,064302
                                        .ENDC
                                        .WORD   026710,100703
                                        .WORD   045277,140362
                                        .WORD   130467,136273
                                        .WORD   103896,123153
                                        .WORD   032166,074657
                                        .WORD   047254,154742
                                        .WORD   133561,101646
                                        .WORD   107210,134016
                                        .WORD   035050,036032
                                        .WORD   041214,103131
                                        .WORD   136231,064546
                                        .WORD   071423,125024
                                        .WORD   037243,032743
                                        .WORD   035655,051557
                                        .WORD   140049,050747
                                        .WORD   036459,171222
                                CONS13: .WORD   040311,007732
                                        .WORD   121041,064302
                                        .ENDC
                                        .TITLE  SQSQ03
                                        .IFDF   CND$14

                                        .GLOBL  DSQRT,$ERR
                                        .IFNDF  FPU
                                        .GLOBL  $ADD,$DVD,$POLSH
                                        .ENDC
                                        R0=%0
                                        R1=%1
                                        R2=%2
                                        R3=%3
                                        R4=%4
                                        R5=%5
                                        F0=%0
                                        F1=%1
                                        F2=%2
                                        SP=%6
                                        .IFNDF  FPU
                                DSQRT:  MOV     R5,-(SP)
                                        MOV     2(R5),R5
                                        MOV     @R5,R1
                                        BMI     ERR$14
                                        BEQ     2$R$14
                                        MOV     2(R5),R2
                                        MOV     #4,-(SP)
                                        ASR     R1
                                        ROR     R2
```

427

```
2524                                    ADD     #20100,R1
2525                                    CLR     -(SP)
2526                                    CLR     -(SP)
2527                                    MOV     R2,-(SP)
2528                                    MOV     R1,-(SP)
2529                                    CLR     -(SP)
2530                                    CLR     -(SP)
2531                                    MOV     2(R5),-(SP)
2532                                    MOV     @R5,-(SP)
2533                                    CLR     -(SP)
2534                                    CLR     -(SP)
2535                                    MOV     R2,-(SP)
2536                                    MOV     R1,-(SP)
2537                            LUPS14: JSR     R4,$POLSH
2538                                    .WORD   $DVD,$ADD,UPLS14
2539                            UPLS14: SUB     #200,@SP
2540                                    DEC     8.(SP)
2541                                    BEQ     OUTS14
2542                                    MOV     6(R5),-(SP)
2543                                    MOV     4(R5),-(SP)
2544                                    MOV     2(R5),-(SP)
2545                                    MOV     @R5,-(SP)
2546                                    MOV     14.(SP),-(SP)
2547                                    MOV     14.(SP),-(SP)
2548                                    MOV     14.(SP),-(SP)
2549                                    MOV     14.(SP),-(SP)
2550                                    BR      LUPS14
2551                            OUTS14: MOV     (SP)+,R0
2552                                    MOV     (SP)+,R1
2553                                    MOV     (SP)+,R2
2554                                    MOV     (SP)+,R3
2555                                    TST     (SP)+
2556                            RTNS14: MOV     (SP)+,R5
2557                                    RTS     R5
2558                            ERRS14: JSR     R5,$ERR
2559                                    BR      RTNS14
2560                                    .BYTE   4
2561                                    .BYTE   4
2562                            ZERS14: CLR     R0
2563                                    CLR     R1
2564                                    CLR     R2
2565                                    CLR     R3
2566                                    BR      RTNS14
2567                                    .ENDC
2568                                    .IFDF   FPU
2569                            DSQRT:  MOV     2(R5),R4
2570                                    MOV     @R4,R1
2571                                    BMI     ERRS14
2572                                    BEQ     ZERS14
2573                                    MOV     2(R4),R2
2574                                    ASR     R1
2575                                    ROR     R2
2576                                    ADD     #20100,R1
2577                                    CLR     -(SP)
2578                                    CLR     -(SP)
```

428


```
2579                                    MOV     R2,-(SP)
2580                                    MOV     R1,-(SP)
2581                                    MOV     #4,R0
2582                                    SETD
2583                                    LDD     (SP)+,F0
2584                                    LDD     @R4,F2
2585                            LUPS14: LDD     F0,F1
2586                                    LDD     F2,F0
2587                                    DIVD    F1,F0
2588                                    ADDD    F1,F0
2589                                    DEC     R0
2590                                    DIVD    #2.0,F0
2591                                    BGT     LUPS14
2592                                    STD     F0,-(SP)
2593                                    MOV     (SP)+,R0
2594                                    MOV     (SP)+,R1
2595                                    MOV     (SP)+,R2
2596                                    MOV     (SP)+,R3
2597                                    RTS     R5
2598                            ERRS14: JSR     R5,$ERR
2599                                    RTS     R5
2600                                    .BYTE   4
2601                                    .BYTE   4
2602                            ZERS14: CLR     R0
2603                                    CLR     R1
2604                                    CLR     R2
2605                                    CLR     R3
2606                                    RTS     R5
2607                                    .ENDC
2608                                    .ENDC
2609                                    .TITLE  $QTN03
2610                                    .IFDF   CNOS19
2611
2612                                    .GLOBL  DATAN;DATAN2
2613                                    .IFNDF  FPU
2614                                    .GLOBL  $ADD,$SBD,$MLD,$DVD,$POLSH,$POPR4
2615                                    .ENDC
2616                                    R0=%0
2617                                    R1=%1
2618                                    R2=%2
2619                                    R3=%3
2620                                    R4=%4
2621                                    R5=%5
2622                                    SP=%6
2623                                    F0=%0
2624                                    F1=%1
2625                                    F2=%2
2626                                    F3=%3
2627                                    F4=%4
2628                                    F5=%5
2629                                    .IFNDF  FPU
2630                            DATAN2: MOV     R5,-(SP)
2631                                    CLR     -(SP)
2632                                    CLR     -(SP)
2633                                    CLR     -(SP)
```

429

```
2634                                    CLR     -(SP)
2635                                    CLR     -(SP)
2636                                    CLR     -(SP)
2637                                    CLR     -(SP)
2638                                    CLR     -(SP)
2639                                    CLR     -(SP)
2640                                    MOV     2(R5),R4
2641                                    MOV     6(R4),-(SP)
2642                                    MOV     4(R4),-(SP)
2643                                    MOV     2(R4),-(SP)
2644                                    MOV     @R4,-(SP)
2645                                    MOV     @SP,R0
2646                                    MOV     4(R5),R4
2647                                    MOV     6(R4),-(SP)
2648                                    MOV     4(R4),-(SP)
2649                                    MOV     2(R4),-(SP)
2650                                    MOV     @R4,-(SP)
2651                                    MOV     @SP,R1
2652                                    BEQ     INF$15
2653                                    ASL     R0
2654                                    CLRB    R0
2655                                    SWAB    R0
2656                                    ASL     R1
2657                                    CLRB    R1
2658                                    SWAB    R1
2659                                    SUB     R1,R0
2660                                    CMP     #56.,R0
2661                                    BLT     INF$15
2662                            DIV$15: JSR     R4,$FOL$H
2663                                    .WORD   $DVD,UPL$15
2664                            UPL$15: TST     @4(R5)
2665                                    BGE     ATE$15
2666                                    MOV     #040511,16.(SP)
2667                                    MOV     #007732,18.(SP)
2668                                    MOV     #121041,20.(SP)
2669                                    MOV     #064301,22.(SP)
2670                                    TST     @2(R5)
2671                                    BGE     ATE$15
2672                                    ADD     #100000,16.(SP)
2673                            ATE$15: TST     @SP
2674                                    BR      AT1$15
2675                            INF$15: ADD     #36.,SP
2676                                    MOV     #040511,R0
2677                                    MOV     #007732,R1
2678                                    MOV     #121041,R2
2679                                    MOV     #064301,R3
2680                                    TST     @2(R5)
2681                                    BGE     INR$15
2682                                    ADD     #100000,R0
2683                            INR$15: RTS     R4
2684                            DATAN:  MOV     R4,-(SP)
2685                                    CLR     -(SP)
2686                                    CLR     -(SP)
2687                                    CLR     -(SP)
2688                                    CLR     -(SP)
```

430


```
2689                                    CLR     -(SP)
2690                                    CLR     -(SP)
2691                                    CLR     -(SP)
2692                                    CLR     -(SP)
2693                                    CLR     -(SP)
2694                                    MOV     2(R5),R4
2695                                    MOV     6(R4),-(SP)
2696                                    MOV     4(R4),-(SP)
2697                                    MOV     2(R4),-(SP)
2698                                    MOV     @R4,-(SP)
2699                            AT1$15: BGE     PLU$15
2700                                    ADD     #100000,@SP
2701                                    INC     24.(SP)
2702                            PLU$15: CMP     @SP,#40200
2703                                    BLO     LE1$15
2704                                    BGT     GT1$15
2705                                    TST     2(SP)
2706                                    BNE     GT1$15
2707                                    TST     4(SP)
2708                                    BNE     GT1$15
2709                                    TST     6(SP)
2710                                    BEQ     LE1$15
2711                            GT1$15: MOV     #140311,8.(SP)
2712                                    MOV     #007732,10.(SP)
2713                                    MOV     #121041,12.(SP)
2714                                    MOV     #064301,14.(SP)
2715                                    DEC     24.(SP)
2716                                    MOV     6(SP),-(SP)
2717                                    MOV     6(SP),-(SP)
2718                                    MOV     6(SP),-(SP)
2719                                    MOV     6(SP),-(SP)
2720                                    MOV     #40200,8.(SP)
2721                                    CLR     10.(SP)
2722                                    CLR     12.(SP)
2723                                    CLR     14.(SP)
2724                                    JSR     R4,$FOL$H
2725                                    .WORD   $DVD,LE1$15
2726                            LE1$15: MOV     6(SP),-(SP)
2727                                    MOV     6(SP),-(SP)
2728                                    MOV     6(SP),-(SP)
2729                                    MOV     6(SP),-(SP)
2730                                    CLR     8.(SP)
2731                                    CLR     10.(SP)
2732                                    CLR     12.(SP)
2733                                    CLR     14.(SP)
2734                                    CMP     @SP,#037611
2735                                    BLO     L1$15
2736                                    BHI     TN8$15
2737                                    CMP     2(SP),#030242
2738                                    BHI     TN8$15
2739                                    BLO     L1$15
2740                                    CMP     4(SP),#172366
2741                                    BHI     TN8$15
2742                                    BLO     L1$15
2743                                    CMP     6(SP),#065261
```

431

```
                                BLOS    L19S19
                        TN8S19: MOV     #040000,8.(SP)
                                MOV     #005221,10.(SP)
                                MOV     #140535,12.(SP)
                                MOV     #115424,14.(SP)
                                MOV     @SP,R0
                                MOV     2(SP),R1
                                MOV     4(SP),R2
                                MOV     6(SP),R3
                                MOV     #062524,-(SP)
                                MOV     #041302,-(SP)
                                MOV     #131727,-(SP)
                                MOV     #140335,-(SP)
                                MOV     R3,-(SP)
                                MOV     R2,-(SP)
                                MOV     R1,-(SP)
                                MOV     R0,-(SP)
                                CLR     -(SP)
                                CLR     -(SP)
                                CLR     -(SP)
                                MOV     #00200,-(SP)
                                MOV     #062524,-(SP)
                                MOV     #041302,-(SP)
                                MOV     #131727,-(SP)
                                MOV     #040335,-(SP)
                                MOV     R3,-(SP)
                                MOV     R2,-(SP)
                                MOV     R1,-(SP)
                                MOV     R0,-(SP)
                                JSR     R4,$POLSH
                                .WORD   $MLD,$$$D,UPS19,$$$D,$DVD,L19S19
                        L19S19: MOV     @SP,R0
                                MOV     2(SP),R1
                                MOV     4(SP),R2
                                MOV     6(SP),R3
                                MOV     R3,-(SP)
                                MOV     R2,-(SP)
                                MOV     R1,-(SP)
                                MOV     R0,-(SP)
                                MOV     R3,-(SP)
                                MOV     R2,-(SP)
                                MOV     R1,-(SP)
                                MOV     R0,-(SP)
                                JSR     R4,$POLSH
                                .WORD   $MLD
                                .WORD   $POPR4,PLY$19
                        XP0S19: .WORD   $MLD,$ADD,$MLD,$ADD,$MLD,$ADD
                                .WORD   $MLD,$ADD,$MLD,$ADD,$MLD,$ADD
                                .WORD   $MLD,$ADD,$MLD,$ADD,$MLD,$ADD
                                .WORD   $ADD
                                .WORD   SGN$19
                                .WORD   $ADD
                                .WORD   $POPR4
                                .WORD   EXI$19
                        EXI$19: TST     (SP)+
```

432


```
                                MOV     (SP)+,R5
                                RTS     R5
                        UP$19:  MOV     (SP)+,22.(SP)
                                MOV     (SP)+,22.(SP)
                                MOV     (SP)+,22.(SP)
                                MOV     (SP)+,22.(SP)
                                JMP     @(R4)+
                        PLY$19: MOV     #CON$19+8.,R4
                                MOV     #9.,R5
                                BR      PY1$19
                        PY2$19: MOV     R3,-(SP)
                                MOV     R2,-(SP)
                                MOV     R1,-(SP)
                                MOV     R0,-(SP)
                        PY1$19: MOV     -(R4),-(SP)
                                MOV     -(R4),-(SP)
                                MOV     -(R4),-(SP)
                                MOV     -(R4),-(SP)
                                DEC     R5
                                BGT     PY2$19
                                MOV     #XP0$19,R4
                                JMP     @(R4)+
                        SGN$19: TST     10.(SP)
                                BEQ     SG1$19
                                ADD     #100000,@SP
                        SG1$19: JMP     @(R4)+
                                .ENDC
                                .IFDF   FPU
                        DATAN2: SETD
                                MOV     2(R5),R3
                                MOV     4(R5),R4
                                MOV     @R3,R0
                                MOV     @R4,R1
                                BEQ     INF$19
                                ASL     R0
                                CLRB    R0
                                SWAB    R0
                                ASL     R1
                                CLRB    R1
                                SWAB    R1
                                SUB     R1,R0
                                CMP     #58.,R0
                                BLT     INF$19
                                LDD     PI$19,F3
                                LDD     @R3,F0
                                CFCC
                                BGE     A1P$19
                                NEGD    F3
                        A1P$19: LDD     @R4,F1
                                CFCC
                                BLT     A2M$19
                                CLRD    F3
                        A2M$19: DIVD    F1,F0
                                BR      ATI$19
                        INF$19: LDD     PI2$19,F1
```

433

```
                        TST     @R3
                        BGE     EXIS19
                        NEGD    F1
                        BR      EXIS19
                DATAN:  SETD
                        CLRD    F3
                        LDD     @2(R3),F0
                AT:S15: CLR     R4
                        CFCC
                        STD     F3,F5
                        CLRD    F3
                        BGE     PLUS19
                        ABSD    F0
                        INC     R4
                PLUS15: LDD     #1.0,F1
                        CMPD    F0,F1
                        CFCC
                        BLE     LE1S19
                GT:S15: DEC     R4
                        DIVD    F0,F1
                        LDD     F1,F0
                        LDD     P12S19,F3
                LE:S15: STD     F3,F4
                        CLRD    F3
                        CMPD    T15S19,F0
                        CFCC
                        BGE     L15S19
                        LDD     P16S19,F3
                        LDD     F0,F1
                        MULD    RT3S19,F0
                        SUBD    #1.0,F0
                        ADDD    RT3S19,F1
                        DIVD    F1,F0
                L19S15: LDD     F0,F2
                        MULD    F0,F0
                        MOV     #FCOS19,R0
                        MOV     #8.,R1
                        LDD     (R0)+,F1
                XPOS15: MULD    F0,F1
                        DEC     R1
                        ADDD    (R0)+,F1
                        BGT     XPOS19
                        MULD    F2,F1
                        ADDD    F3,F1
                        SUBD    F4,F1
                        TST     R4
                        BEQ     SG1S19
                        NEGD    F1
                SG:S15: ADDD    F0,F1
                EXIS15: STD     F1,-(SP)
                        MOV     (SP)+,R0
                        MOV     (SP)+,R1
                        MOV     (SP)+,R2
                        MOV     (SP)+,R3
                        RTS     R5
```

434


```
                PI:S15: .WORD   040511,007732
                        .WORD   121041,064301
                PI2S15: .WORD   040311,007732
                        .WORD   121041,064301
                T15S15: .WORD   037611,030242
                        .WORD   172360,065261
                P16S15: .WORD   040000,005221
                        .WORD   140553,115454
                RT3S15: .WORD   040333,131727
                        .WORD   041302,062524
                        .ENDC
                FCOS15: .WORD   037665,150707
                        .WORD   162300,163630
                        .WORD   137206,143233
                        .WORD   040010,000413
                        .WORD   037235,043002
                        .WORD   037154,142446
                        .WORD   137272,025471
                        .WORD   116412,065630
                        .WORD   037343,107047
                        .WORD   023625,025401
                        .WORD   137422,044444
                        .WORD   071339,116151
                        .WORD   037516,140314
                        .WORD   140224,165650
                        .WORD   137652,125252
                        .WORD   125252,113602
                CONS15: .WORD   040200,000000
                        .WORD   000000,000000
                        .ENDC
                        .EOT
```

435

```
                                ;                                   BASIC SOURCE FILE #12
                                        .TITLE  SDVD03
                                        .IFDF   CND$10
                                        .GLOBL  SDVD,$ERRA
                                        R0=%0
                                        R1=%1
                                        R2=%2
                                        R3=%3
                                        R4=%4
                                        R5=%5
                                        SP=%6
                                        PC=%7
                                        F0=%0
                                        F1=%1
                                        D=0,
                                        N=16,
                                        Q=16,
                                        .IFDF   FPU
                                SDVD1:  .WORD   170011
                                        .WORD   172520
                                        .WORD   172420
                                        .WORD   174401
                                        .WORD   174040
                                        JMP     @(R4)+
                                        .ENDC
                                        .IFNDF  FPU
                                SDVD1:  MOV     R4,-(SP)
                                        MOV     R5,-(SP)
                                        CLR     R0
                                        CLR     R1
                                        CLR     R2
                                        CLR     R3
                                        CLR     -(SP)
                                        ASL     N+6+2(SP)
                                        ROL     @SP
                                        CLR     -(SP)
                                        TST     D(SP)
                                        BEQ     DCHS10
                                        BISB    N+1(SP),@SP
                                        BEQ     ZERS10
                                        BISB    N(SP),R0
                                        SWAB    R0
                                        SEC
                                        ROR     R0
                                        BISB    N+3(SP),R0
                                        BISB    N+2(SP),R1
                                        SWAB    R1
                                        BISB    N+5(SP),R1
                                        BISB    N+4(SP),R2
                                        SWAB    R2
                                        BISB    N+7(SP),R2
                                        BISB    N+6(SP),R3
                                        SWAB    R3
                                        ASL     D(SP)
                                        ADC     Z(SP)
```

436


```
                                        CLR     R4
                                        BISB    D+1(SP),R4
                                        SUB     R4,@SP
                                        SWAB    D(SP)
                                        SEC
                                        ROR     D(SP)
                                        MOVB    D+3(SP),D(SP)
                                        MOVB    D+2(SP),D+3(SP)
                                        MOVB    D+5(SP),D+2(SP)
                                        MOVB    D+4(SP),D+5(SP)
                                        MOVB    D+7(SP),D+4(SP)
                                        MOVB    D+6(SP),D+7(SP)
                                        CLRB    D+6(SP)
                                        CLR     Q(SP)
                                        CLR     Q+2(SP)
                                        CLR     Q+4(SP)
                                        CMP     R0,D(SP)
                                        BHI     DLWS10
                                        BLO     DHIS10
                                        CMP     R1,D+2(SP)
                                        BHI     DLWS10
                                        BLO     DHIS10
                                        CMP     R2,D+4(SP)
                                        BHI     DLWS10
                                        BLO     DHIS10
                                        CMP     R3,D+6(SP)
                                        BHI     DLWS10
                                        BNE     DHIS10
                                        INC     @SP
                                        CLR     R4
                                        BR      FLTS10
                                DCHS16: MOV     #1403,R0
                                        BR      ECIS10
                                UNDS16: MOV     #4005,R0
                                ECLS16: TST     -(SP)
                                ECIS16: JSR     R5,$ERRA
                                ZERS16: CMP     (SP)+,(SP)+
                                        CLR     Q+0+4(SP)
                                        CLR     Q+2+4(SP)
                                        CLR     Q+4+4(SP)
                                        CLR     Q+6+4(SP)
                                        BR      RTNS10
                                DLWS16: ROR     R0
                                        ROR     R1
                                        ROR     R2
                                        ROR     R3
                                        INC     @SP
                                DHIS16: MOV     #9.,R5
                                        JSR     PC,DVIS16
                                        MOVB    R4,Q(SP)
                                        TST     R5
                                        BNE     FLIS10
                                        MOV     #10.,R5
                                        JSR     PC,DVIS16
```

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```
3051                                    MOV     R4,Q+2(SP)
3052                                    TST     R5
3053                                    BNE     FL1$10
3054                                    MOV     #16.,R5
3055                                    JSR     PC,DV1$16
3056                                    MOV     R4,Q+4(SP)
3057                                    TST     R5
3058                                    BNE     FL1$10
3059                                    MOV     #16.,R5
3060                                    JSR     PC,DV1$16
3061                                    BR      FLT$10
3062                            FL1$16: CLR     R4
3063                            FLT$16: MOV     (SP)+,R5
3064                                    ADD     #200,R5
3065                                    BLE     UND$10
3066                                    CMP     #377,R5
3067                                    BLT     OVR$10
3068                                    MOVB    R5,Q+1+2(SP)
3069                            SGN$16: ROR     (SP)+
3070                                    ROR     Q+6+4(SP)
3071                                    ROR     Q+2+4(SP)
3072                                    ROR     Q+4+4(SP)
3073                                    ROR     R4
3074                                    ADC     R4
3075                                    ADC     Q+4+4(SP)
3076                                    ADC     Q+2+4(SP)
3077                                    ADC     Q+6+4(SP)
3078                                    MOV     R4,Q+6+4(SP)
3079                                    BCS     OV1$10
3080                                    BVS     OV1$10
3081                            RTN$16: MOV     (SP)+,R5
3082                                    MOV     (SP)+,R4
3083                                    ADD     #8.,SP
3084                                    JMP     @(R4)+
3085                            OV1$16: TST     -(SP)
3086                            OVR$16: MOV     #2883,R0
3087                                    BR      EQL$10
3088                            DV1$16: ASL     R4
3089                                    ASL     R3
3090                                    ROL     R2
3091                                    ROL     R1
3092                                    ROL     R0
3093                                    BCS     GO$16
3094                                    CMP     Q+6+2(SP),R0
3095                                    BHI     NGO$10
3096                                    BLO     GO$16
3097                                    CMP     Q+2+2(SP),R1
3098                                    BHI     NGO$10
3099                                    BLO     GO$16
3100                                    CMP     Q+4+2(SP),R2
3101                                    BHI     NGO$10
3102                                    BLO     GO$16
3103                                    CMP     Q+6+2(SP),R3
3104                                    BHI     NGO$10
3105                                    BEQ     NQD$10
```

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```
3106                            GO$16:  SUB     Q+6+2(SP),R3
3107                                    SBC     R2
3108                                    SBC     R1
3109                                    SBC     R0
3110                                    SUB     Q+4+2(SP),R2
3111                                    SBC     R1
3112                                    SBC     R0
3113                                    SUB     Q+2+2(SP),R1
3114                                    SBC     R0
3115                                    SUB     Q+6+2(SP),R0
3116                                    INC     R4
3117                            NGO$16: DEC     R5
3118                                    BGT     OV1$10
3119                                    RTS     PC
3120                            NQD$16: INC     R4
3121                                    BR      EQ1$10
3122                            EQ2$16: ASL     R4
3123                            EQ1$16: DEC     R5
3124                                    BGT     EQ2$10
3125                                    INC     R5
3126                            RTS$16: RTS     PC
3127                                    .ENDC
3128                                    .ENDC
3129                                    .TITLE  $DVI03
3130                                    .IFDF   GND$17
3131                                    .GLOBL  $DVI,$ERR
3132                                    R0=%0
3133                                    R1=%1
3134                                    R2=%2
3135                                    R3=%3
3136                                    R4=%4
3137                                    R5=%5
3138                                    SP=%6
3139                                    MQ=177304
3140                                    .IFNDF  EAE&MVLDIV
3141                            $DVI:   CLR     R0
3142                                    MOV     (SP)+,R1
3143                                    BGT     P1$17
3144                                    BEQ     CHK$17
3145                                    INC     R0
3146                                    NEG     R1
3147                            P1$17:  MOV     @SP,R3
3148                                    BGT     P2$17
3149                                    BEQ     ERR$17
3150                                    INC     R0
3151                                    NEG     R3
3152                            P2$17:  MOV     R4,-(SP)
3153                                    MOV     #8.,R4
3154                                    CLR     R2
3155                                    SWAB    R3
3156                                    BEQ     DIV$17
3157                                    ASL     R4
3158                                    SWAB    R3
3159                            DIV$17: ASL     R3
3160                                    ROL     R2
```

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```
3161                                            BEQ     LUP$17
3162                                            INC     R3
3163                                            SUB     R1,R2
3164                                            BHIS    LUP$17
3165                                            ADD     R1,R2
3166                                            DEC     R3
3167                                    LUP$17: DEC     R4
3168                                            BGT     DIV$17
3169                                            MOV     (SP)+,R4
3170                                            NEG     R3
3171                                            ASR     R0
3172                                            BCS     P3$17
3173                                            NEG     R3
3174                                            BVS     CHK$17
3175                                    P3$17:  MOV     R3,@SP
3176                                            JMP     @(R4)+
3177                                    ZER$17: CLR     @SP
3178                                            JMP     @(R4)+
3179                                            .ENDC
3180                                            .IFDF   EAE
3181                                    $DVI:   MOV     @MQ,R0
3182                                            MOV     (SP)+,R1
3183                                            BEQ     CHK$17
3184                                            MOV     (SP)+,@R0
3185                                            TST     -(R0)
3186                                            MOV     R1,-(R0)
3187                                            CMP     (R0)+,(R0)+
3188                                            MOV     @R0,-(SP)
3189                                            JMP     @(R4)+
3190                                            .ENDC
3191                                            .IFDF   MULDIV
3192                                    $DVI:   MOV     2(SP),R1
3193                                            .WORD   006700
3194                                            .WORD   071020
3195                                            MOV     R0,@SP
3196                                            BCS     CHK$17
3197                                            JMP     @(R4)+
3198                                            .ENDC
3199                                    CHK$17: JSR     R5,$ERR
3200                                            JMP     @(R4)+
3201                                            .BYTE   3
3202                                            .BYTE   9
3203                                            .ENDC
3204                                            .TITLE  $DVR00
3205                                            .IFDF   CND$10
3206                                            .GLOBL  $DVR,$ERRA
3207            000000                          R00=%0
3208            000001                          R1=%1
3209            000002                          R2=%2
3210            000003                          R3=%3
3211            000004                          R4=%4
3212            000005                          R5=%5
3213            000006                          SP=%6
3214            000007                          PC=%7
3215            177304                          MQ=177304
```

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```
3216            177312                          NOR=177312
3217            177314                          LSH=177314
3218            177316                          ASH=177316
3219            000000                          F00=%0
3220            000001                          F10=%1
3221            000010                          D=8.
3222            000014                          N=12.
3223            000014                          Q=12.
3224                                            .IFDF   FPU
3225                                    $DVR:   .WORD   170001
3226                                            .WORD   172520
3227                                            .WORD   172420
3228                                            .WORD   174401
3229                                            .WORD   174040
3230                                            JMP     @(R4)+
3231                                            .ENDC
3232                                            .IFNDF  FPU
3233    001234' 010446                  $DVR:   MOV     R4,-(SP)
3234    001236' 010546                          MOV     R5,-(SP)
3235    001240' 005000                          CLR     R0
3236    001242' 005001                          CLR     R1
3237    001244' 005046                          CLR     -(SP)
3238    001246' 006366  000012                  ASL     N+6-2(SP)
3239    001252' 006116                          ROL     @SP
3240    001254' 005046                          CLR     -(SP)
3241    001256' 005766  000010                  TST     D(SP)
3242    001262' 001456                          BEQ     DCHK$10
3243    001264' 156616  000015                  BISB    N+1(SP),@SP
3244    001270' 001451                          BEQ     ZER$10
3245    001272' 156600  000014                  BISB    N(SP),R0
3246    001276' 000300                          SWAB    R0
3247    001300' 000261                          SEC
3248    001302' 006000                          ROR     R0
3249    001304' 156600  000017                  BISB    N+3(SP),R0
3250    001310' 156601  000016                  BISB    N+2(SP),R1
3251    001314' 000301                          SWAB    R1
3252    001316' 005002                          CLR     R2
3253    001320' 005003                          CLR     R3
3254    001322' 006366  000010                  ASL     D(SP)
3255    001326' 005566  000002                  ADC     2(SP)
3256    001332' 156602  000011                  BISB    D+1(SP),R2
3257    001336' 160216                          SUB     R2,@SP
3258    001340' 005002                          CLR     R2
3259    001342' 156602  000010                  BISB    D(SP),R2
3260    001346' 000302                          SWAB    R2
3261    001350' 000261                          SEC
3262    001352' 006002                          ROR     R2
3263    001354' 156602  000013                  BISB    D+5(SP),R2
3264    001360' 156603  000012                  BISB    D+2(SP),R3
3265    001364' 000303                          SWAB    R3
3266                                            .IFDF   EAE!MULDIV
3267                                            CLC
3268                                            ROR     R0
3269                                            ROR     R1
3270                                            ROR     R2
```

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```
3271                                                    ROR     R5
3272                                                    .ENDC
3273  001366' 020002                                   CMP     R0,R2
3274  001370' 103440                                   BLO     DH1$10
3275                                                    .IFNDF  EAE&MULDIV
3276  001372' 101034                                   BHI     OLW$10
3277  001374' 020103                                   CMP     R1,R3
3278  001376' 101032                                   BHI     OLW$10
3279  001400' 001034                                   BNE     DH1$10
3280  001402' 005066  000014                           CLR     0(SP)
3281  001406' 005216                                   INC     @SP
3282  001410' 005005                                   CLR     R5
3283  001412' 000445                                   BR      FLT$10
3284                                                    .ENDC
3285                                                    .IFDF   EAE!MULDIV
3286                                                    BHIS    OLW$10
3287                                                    .ENDC
3288  001414' 022626                            ZERS10! CMP     (SP)+,(SP)+
3289  001416' 000415                                   BR      EC1$10
3290  001420' 005726                            OCW$10! TST     (SP)+
3291  001422' 012700  004003                           MOV     #4003,R0
3292  001426' 000406                                   BR      ECL$10
3293  001430' 005746                            OVI$10! TST     -(SP)
3294  001432' 012700  003003                    OVR$10! MOV     #3003,R0
3295  001436' 000402                                   BR      ECL$10
3296  001440' 012700  001405                    UNO$10! MOV     #1405,R0
3297  001444' 005726                            ECL$10! TST     (SP)+
3298  001446' 004567  002570                           JSR     R5,$ERRA
3299  001452' 005066  000010                    EC1$10! CLR     Q+0=4(SP)
3300  001456' 005066  000012                           CLR     Q+2=4(SP)
3301  001462' 000445                                   BR      RTN$10
3302  001464' 006000                            OLW$10! ROR     R0
3303  001466' 006001                                   ROR     R1
3304  001470' 005216                                   INC     @SP
3305                                                    .IFNDF  EAE&MULDIV
3306  001472' 012704  000011                    OH!$10! MOV     #9.,R4
3307  001476' 004767  000104                           JSR     PC,DV1$10
3308  001502' 110566  000014                           MOVB    R5,Q(SP)
3309
3310  001506' 005704                                   TST     R4
3311  001510' 001402                                   BEQ     NT0$10
3312  001512' 005005                                   CLR     R5
3313  001514' 000404                                   BR      FLT$10
3314  001516' 012704  000020                    NT0$10! MOV     #16.,R4
3315  001522' 004767  000060                           JSR     PC,DV1$10
3316                                                    .ENDC
3317                                                    .IFDF   EAE!MULDIV
3318                                             DH!$10! CLC
3319                                                    ROR     R5
3320                                                    ROR     R0
3321                                                    ROR     R1
3322                                                    .ENDC
3323                                                    .IFDF   EAE
3324                                                    MOV     @MQ,R5
3325                                                    MOV     R1,@R5
```

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```
3326                                                    MOV     R0,-(R5)
3327                                                    MOV     R2,-(R5)
3328                                                    TST     (R5)+
3329                                                    MOV     (R5)+,R1
3330                                                    MOV     (R5)+,R4
3331                                                    MOV     R5,@R5
3332                                                    TST     -(R5)
3333                                                    ASR     R1
3334                                                    SUB     R1,-(R5)
3335                                                    DEC     @@ASH
3336                                                    MOV     R2,-(R5)
3337                                                    CMP     (R5)+,(R5)+
3338                                                    NEG     @R5
3339                                                    MOV     #2,@@ASH
3340                                                    ADD     R4,-(R5)
3341                                                    CLR     @@NOR
3342                                                    SUB     @@NOR,@SP
3343                                                    MOV     #-4,@@LSH
3344                                                    MOV     (R5)+,Q(SP)
3345                                                    MOV     @R5,R5
3346                                                    .ENDC
3347                                                    .IFDF   MULDIV
3348                                                    MOV     R0,R4
3349                                                    MOV     R1,R5
3350                                                    .WORD   071402
3351                                                    MOV     R5,R1
3352                                                    MOV     R4,R0
3353                                                    .WORD   070403
3354                                                    ASR     R1
3355                                                    SUB     R1,R4
3356                                                    .WORD   073427,-1
3357                                                    .WORD   071402
3358                                                    NEG     R4
3359                                                    .WORD   073427,-14.
3360                                                    ADD     R0,R4
3361                                             NBT$10! .WORD   073427,1
3362                                                    BMI     NB!$10
3363                                                    DEC     @SP
3364                                                    BR      NBT$10
3365                                             NB!$10! .WORD   073427,-7
3366                                                    MOV     R4,Q(SP)
3367                                                    .ENDC
3368  001526' 012604                            FLT$10! MOV     (SP)+,R4
3369  001530' 062704  000200                           ADD     #200,R4
3370  001534' 003741                                   BLE     UNO$10
3371  001536' 022704  000377                           CMP     #377,R4
3372  001542' 002733                                   BLT     OVR$10
3373  001544' 110466  000013                           MOVB    R4,Q+1-2(SP)
3374  001550' 006026                            SGN$10! ROR     (SP)+
3375  001552' 006066  000010                           ROR     Q+0=4(SP)
3376  001556' 006005                                   ROR     R5
3377  001560' 005505                                   ADC     R5
3378  001562' 005566  000010                           ADC     Q+0=4(SP)
3379  001566' 010566  000012                           MOV     R5,Q+2=4(SP)
3380  001572' 103716                                   BCS     OV1$10
```

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```
3381  001574' 102715                  BVS     DV1$18
3382  001576' 012605          RTN$18: MOV     (SP)+,R5
3383  001600' 012604                  MOV     (SP)+,R4
3384  001602' 022626                  CMP     (SP)+,(SP)+
3385  001604' 000134                  JMP     @(R4)+
3386                                  .IFNDF  EAE&MULDIV
3387  001606' 006305          DVI$18: ASL     R5
3388  001610' 006301                  ASL     R1
3389  001612' 006100                  ROL     R0
3390  001614' 103406                  BCS     GO$18
3391  001616' 020200                  CMP     R2,R0
3392  001620' 101010                  BHI     NGO$18
3393  001622' 103403                  BLO     GO$18
3394  001624' 020301                  CMP     R3,R1
3395  001626' 101005                  BHI     NGO$18
3396  001630' 001407                  BEQ     NGO$18
3397  001632' 160301          GO$18:  SUB     R3,R1
3398  001634' 005600                  SBC     R0
3399  001636' 160200                  SUB     R2,R0
3400  001640' 005205                  INC     R5
3401  001642' 005304          NGO$18: DEC     R4
3402  001644' 003360                  BGT     DV1$18
3403  001646' 000207                  RTS     PC
3404  001650' 005205          NGO$18: INC     R5
3405  001652' 000401                  BR      EQ1$18
3406  001654' 006305          EQ2$18: ASL     R5
3407  001656' 005304          EQI$18: DEC     R4
3408  001660' 003375                  BGT     EQ2$18
3409  001662' 005204                  INC     R4
3410  001664' 000207          RTS$18: RTS     PC
3411                                  .ENDC
3412                                  .ENDC
3413                                  .ENDC
3414                                  .TITLE  $DXP05
3415                                  .IFDF   CND$19
3416                                  .GLOBL  DEXP,$ERRA
3417                                  .IFNDF  FPU
3418                                  .GLOBL  $ADD,$SBD,$MLD,$DVD,$ID,$DI,$POLSH,$POPR4
3419                                  .ENDC
3420                                  R0=%0
3421                                  R1=%1
3422                                  R2=%2
3423                                  R3=%3
3424                                  R4=%4
3425                                  R5=%5
3426                                  SP=%6
3427                                  F0=%0
3428                                  F1=%1
3429                                  F2=%2
3430                                  F3=%3
3431                                  .IFDF   FPU
3432                          DEXP:   MOV     @2(R5),R0
3433                                  .ENDC
3434                                  .IFNDF  FPU
3435                          DEXP:   MOV     R5,-(SP)
```

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```
3436                                  MOV     2(R5),R4
3437                                  MOV     @R4,R0
3438                                  .ENDC
3439                                  BGT     POS$19
3440                                  CMP     R0,#141662
3441                                  BHI     ZER$19
3442                                  BR      SMT$19
3443                          POS$19: CMP     R0,#41660
3444                                  BHI     OVR$19
3445                          SMT$19: ASL     R0
3446                                  CMP     R0,#43000
3447                                  BLO     ONE$19
3448                                  .IFNDF  FPU
3449                                  SUB     #20,,SP
3450                                  ADD     #8.,R4
3451                                  MOV     -(R4),-(SP)
3452                                  MOV     -(R4),-(SP)
3453                                  MOV     -(R4),-(SP)
3454                                  MOV     -(R4),-(SP)
3455                                  MOV     #013701,-(SP)
3456                                  MOV     #024534,-(SP)
3457                                  MOV     #125073,-(SP)
3458                                  MOV     #40270,-(SP)
3459                                  JSR     R4,$POLSH
3460                                  .WORD   $MLD
3461                                  .WORD   DUP$19
3462                                  .WORD   $DI
3463                                  .WORD   ADJ$19
3464                                  .WORD   $ID
3465                                  .WORD   $SBD
3466                                  .WORD   M16$19
3467                                  .WORD   DUP$19
3468                                  .WORD   $DI
3469                                  .WORD   DSV$19
3470                                  .WORD   $ID
3471                                  .WORD   $SBD,Q16$19
3472                                  .WORD   DUP$19,DUP$19
3473                                  .WORD   $MLD
3474                                  .WORD   $POPR4
3475                                  .WORD   UPL$19
3476                          ONE$19: MOV     #40200,R0
3477                                  BR      Z1$19
3478                          OVR$19: MOV     #1004,R0
3479                                  BR      ECL$19
3480                          ZER$19: MOV     #2005,R0
3481                          ECL$19: JSR     R5,$ERRA
3482                                  CLR     R0
3483                          Z1$19:  CLR     R1
3484                                  CLR     R2
3485                                  CLR     R3
3486                                  BR      OUT$19
3487                          UPL$19: MOV     #033343,-(SP)
3488                                  MOV     #015345,-(SP)
3489                                  MOV     #152405,-(SP)
3490                                  MOV     #040746,-(SP)
```

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```
                                        MOV     R3,-(SP)
                                        MOV     R2,-(SP)
                                        MOV     R1,-(SP)
                                        MOV     R0,-(SP)
                                        MOV     #153703,-(SP)
                                        MOV     #153011,-(SP)
                                        MOV     #113300,-(SP)
                                        MOV     #037154,-(SP)
                                        MOV     R3,-(SP)
                                        MOV     R2,-(SP)
                                        MOV     R1,-(SP)
                                        MOV     R0,-(SP)
                                        MOV     #171042,-(SP)
                                        MOV     #074435,-(SP)
                                        MOV     #101232,-(SP)
                                        MOV     #041240,-(SP)
                                        JSR     R4,$POLSH
                                        .WORD   $ADD,AUP$19
                                        .WORD   $MLD,$ADD,$MLD
                                        .WORD   TWC$19
                                        .WORD   $ADD,ABP$19
                                        .WORD   $$BD,$DVD
                                        .WORD   SCL$19
                                SCL$19| MOV     #RT2$19+8.,R5
                                ASR$19| ASR     0,(SP)
                                        BCC     NML$19
                                        MOV     -(R5),-(SP)
                                        MOV     -(R5),-(SP)
                                        MOV     -(R5),-(SP)
                                        MOV     -(R5),-(SP)
                                        JSR     R4,$POLSH
                                        .WORD   $MLD,ASR$19
                                NML$19| BEQ     SC1$19
                                        SUB     #8.,R5
                                        BR      ASR$19
                                SC1$19| MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R2
                                        MOV     (SP)+,R3
                                        TST     (SP)+
                                        MOV     (SP)+,R4
                                        SWAB    R4
                                        CLRB    R4
                                        ASR     R4
                                        ADD     R4,R0
                                        BMI     OVR$19
                                OUT$19| MOV     (SP)+,R5
                                        RTS     R5
                                ADJ$19| TST     02(R5)
                                        BGE     ARN$19
                                        DEC     @SP
                                ARN$19| MOV     @SP,20.(SP)
                                        JMP     @(R4)+
                                M16$19| ADD     #1000,@SP
                                        JMP     @(R4)+
```

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```
                                D16$19| SUB     #1000,@SP
                                        BPL     D6R$19
                                        CLR     @SP
                                D6R$19| JMP     @(R4)+
                                DSV$19| MOV     @SP,20.(SP)
                                        JMP     @(R4)+
                                AUP$19| MOV     (SP)+,38.(SP)
                                        MOV     (SP)+,38.(SP)
                                        MOV     (SP)+,38.(SP)
                                        MOV     (SP)+,38.(SP)
                                        JMP     @(R4)+
                                ABP$19| MOV     (SP)+,22.(SP)
                                        MOV     (SP)+,22.(SP)
                                        MOV     (SP)+,22.(SP)
                                        MOV     (SP)+,22.(SP)
                                        JMP     @(R4)+
                                OUP$19| MOV     6(SP),-(SP)
                                        MOV     6(SP),-(SP)
                                        MOV     6(SP),-(SP)
                                        MOV     6(SP),-(SP)
                                        JMP     @(R4)+
                                TWC$19| MOV     #8.,R0
                                TWI$19| MOV     14.(SP),-(SP)
                                        DEC     R0
                                        BGT     TWI$19
                                        JMP     @(R4)+
                                        .WORD   040265,002363,031771,157145
                                        .WORD   040230,033760,050615,134251
                                        .WORD   040213,112701,161752,105727
                                RT2$19| .WORD   040205,125303,063714,044173
                                        .ENDC
                                        .IFDF   FPU
                                        SETD
                                        SETI
                                        MOV     #FCO$19,R0
                                        LDD     @2(R5),F2
                                        MODD    (R0)+,F2
                                        STCDI   F3,R4
                                        TSTD    F2
                                        CFCC
                                        BGE     M16$19
                                        ADDD    #1.0,F2
                                        DEC     R4
                                M16$19| MODD    #16.0,F2
                                        STCDI   F3,R3
                                        DIVD    #16.0,F2
                                        LDD     F2,F3
                                        MULD    F3,F3
                                        LDD     F3,F1
                                        ADDD    (R0)+,F1
                                        MULD    (R0)+,F3
                                        ADDD    (R0)+,F3
                                        MULD    F2,F3
                                        LDD     F1,F0
                                        ADDD    F3,F0
```

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```
                                        SUBD    F3,F1
                                        DIVD    F3,F0
                                SCL$19: ASR     R3
                                        BCC     NML$19
                                        MULD    (R0)+,F0
                                        BR      SCL$19
                                NML$19: BEQ     SCI$19
                                        ADD     #8.,R0
                                        BR      SCL$19
                                SCI$19: STD     F0,-(SP)
                                        MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R2
                                        MOV     (SP)+,R3
                                        SWAB    R4
                                        CLRB    R4
                                        ASR     R4
                                        ADD     R4,R0
                                        BMI     OVR$19
                                        RTS     R5
                                ONE$19: MOV     #40200,R0
                                        BR      Z1$19
                                OVR$19: MOV     #1004,R0
                                        BR      ECL$19
                                ZER$19: MOV     #2005,R0
                                ECL$19: JSR     R5,$ERRA
                                        CLR     R0
                                Z1$19:  CLR     R1
                                        CLR     R2
                                        CLR     R3
                                        RTS     R5
                                FCO$19: .WORD   40270,125073,024534,013701
                                        .WORD   041240,101232,074433,171042
                                        .WORD   037156,113360,153061,153703
                                        .WORD   040746,152405,015345,033343
                                        .WORD   040205,125303,063714,044173
                                        .WORD   040214,114701,161752,105727
                                        .WORD   040230,033760,050615,134251
                                        .WORD   040265,002363,031771,157145
                                        .ENDC
                                        .ENDC
                                        .TITLE  $EXP04
                                        .IFDF   CND$20

                                        .GLOBL  EXP,$ERRA
                                        .IFNDF  FPU
                                        .GLOBL  $AOR,$SOR,$MLR,$OVR,$IR,$RI,$POLSH
                                        .ENDC
                        000000          R0=%0
                        000001          R1=%1
                        000002          R2=%2
                        000003          R3=%3
                        000004          R4=%4
                        000005          R5=%5
                        000006          SP=%6
```

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```
                        000007          PC=%7
                        000000          F0=%0
                        000001          F1=%1
                        000002          F2=%2
                        000003          F3=%3
001666' 016504  000002          EXP:    MOV     2(R5),R4
001672' 011400                          MOV     @R4,R0
001674' 003004                          BGT     POS$20
001676' 020027  141662                  CMP     R0,#141662
001702' 101146                          BHI     ZER$20
001704' 000403                          BR      SMT$20
001706' 020027  041660          POS$20: CMP     R0,#41660
001712' 101137                          BHI     OVR$20
001714' 006300                  SMT$20: ASL     R0
001716' 020027  063000                  CMP     R0,#63000
001722' 103527                          BLO     ONE$20
                                        .IFNDF  FPU
001724' 005746                          TST     -(SP)
001726' 005046                          CLR     -(SP)
001730' 012746  040200                  MOV     #40200,-(SP)
001734' 016446  000002                  MOV     2(R4),-(SP)
001740' 011446                          MOV     @R4,-(SP)
001742' 016446  000002                  MOV     2(R4),-(SP)
001746' 011446                          MOV     @R4,-(SP)
001750' 004467  002122                  JSR     R4,$POLSH
001754' 002044'                         .WORD   PLE$20
001756' 002322'                         .WORD   $MLR
001760' 002714'                         .WORD   $RI
001762' 002056'                         .WORD   ESV$20
001764' 002236'                         .WORD   $IR
001766' 002044'                         .WORD   PLE$20
001770' 001234'                         .WORD   $OVR
001772' 000002'                         .WORD   $$BR
001774' 002064'                         .WORD   CFR$20
001776' 002322'                         .WORD   $MLR
002000' 000006'                         .WORD   $AOR
002002' 001234'                         .WORD   $OVR
002004' 000006'                         .WORD   $AOR
002006' 000006'                         .WORD   $AOR
002010' 001234'                         .WORD   $OVR
002012' 002024'                         .WORD   INC$20
002014' 000006'                         .WORD   $AOR
002016' 002032'                         .WORD   DUP$20
002020' 002322'                         .WORD   $MLR
002022' 002160'                         .WORD   SCL$20
002024' 062716  100200          INC$20: ADD     #100200,@SP
002030' 000134                          JMP     @(R4)+
002032' 016646  000002          DUP$20: MOV     2(SP),-(SP)
002036' 016646  000002                  MOV     2(SP),-(SP)
002042' 000134                          JMP     @(R4)+
002044' 012746  125073          PLE$20: MOV     #125073,-(SP)
002050' 012746  040270                  MOV     #40270,-(SP)
002054' 000134                          JMP     @(R4)+
002056' 011666  000012          ESV$20: MOV     @SP,12.(SP)
002062' 000134                          JMP     @(R4)+
```

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```
 3711  002064' 006116                 CFRS20: ROL     @SP
 3712  002066' 006100                         ROL     R0
 3713  002070' 162716  000400                 SUB     #400,@SP
 3714  002074' 103430                         BLOS    ZFRS20
 3715  002076' 006000                         ROR     R0
 3716  002100' 006016                         ROR     @SP
 3717  002102' 011600                         MOV     @SP,R0
 3718  002104' 016601  000002                 MOV     2(SP),R1
 3719  002110' 012746  036602                 MOV     #036602,-(SP)
 3720  002114' 012746  141100                 MOV     #141100,-(SP)
 3721  002120' 010146                         MOV     R1,-(SP)
 3722  002122' 010046                         MOV     R0,-(SP)
 3723  002124' 012746  071571                 MOV     #071571,-(SP)
 3724  002130' 012746  042420                 MOV     #042420,-(SP)
 3725  002134' 012746  056133                 MOV     #056133,-(SP)
 3726  002140' 012746  041500                 MOV     #041500,-(SP)
 3727  002144' 010146                         MOV     R1,-(SP)
 3728  002146' 010046                         MOV     R0,-(SP)
 3729  002150' 010146                         MOV     R1,-(SP)
 3730  002152' 010046                         MOV     R0,-(SP)
 3731  002154' 000134                         JMP     @(R4)+
 3732                                         .ENDC
 3733                                         .IFDF   FPU
 3734                                         SETD
 3735                                         SETI
 3736                                         MOV     #FCOS20,R0
 3737                                         LDCFD   @R4,F2
 3738                                         MODD    (R0)+,F2
 3739                                         STCDI   F3,R4
 3740                                         LDD     #1.0,F0
 3741                                         DIVD    (R0)+,F2
 3742                                         SETF
 3743                                         LDCDF   F2,F2
 3744                                         CFCC
 3745                                         BEQ     SC1S20
 3746                                         LDF     F2,F3
 3747                                         MULF    F3,F3
 3748                                         ADDF    (R0)+,F3
 3749                                         LDF     (R0)+,F1
 3750                                         DIVF    F3,F1
 3751                                         ADDF    F2,F1
 3752                                         ADDF    (R0)+,F1
 3753                                         DIVF    F1,F2
 3754                                         MULF    #2.0,F2
 3755                                         SUBF    F2,F0
 3756                                         MULF    F0,F0
 3757                                 SC1S20: STF     F0,-(SP)
 3758                                         .ENDC
 3759                                         .IFNDF  FPU
 3760  002156' 022626                 ZFRS20: CMP     (SP)+,(SP)+
 3761                                         .ENDC
 3762  002160' 012600                 SCLS20: MOV     (SP)+,R0
 3763  002162' 012601                         MOV     (SP)+,R1
 3764                                         .IFNDF  FPU
 3765  002164' 012604                         MOV     (SP)+,R4
```

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```
 3766                                         .ENDC
 3767  002166' 000304                         SWAB    R4
 3768  002170' 105004                         CLRB    R4
 3769  002172' 006204                         ASR     R4
 3770  002174' 060400                         ADD     R4,R0
 3771  002176' 100405                         BMI     OVRS20
 3772  002200' 000205                         RTS     R5
 3773  002202' 005001                 ONES20: CLR     R1
 3774  002204' 012700  040200                 MOV     #40200,R0
 3775  002210' 000205                         RTS     R5
 3776  002212' 012700  002404         OVRS20: MOV     #2404,R0
 3777  002216' 000402                         BR      ECLS20
 3778  002220' 012700  002405         ZERS20: MOV     #2405,R0
 3779  002224' 004567  002020         ECLS20: JSR     R5,SCMRA
 3780  002230' 005000                         CLR     R0
 3781  002232' 005001                         CLR     R1
 3782  002234' 000205                         RTS     R5
 3783                                         .IFDF   FPU
 3784                                 FCOS20: .WORD   040270,125073
 3785                                         .WORD   024534,013761
 3786                                         .WORD   040470,125073
 3787                                         .WORD   024534,013761
 3788                                         .WORD   041500,056133
 3789                                         .WORD   042420,071571
 3790                                         .WORD   141100,036602
 3791                                         .ENDC
 3792                                         .ENDC
 3793                                         .EOT
 3794
```

451

```
                                ;                                       BASIC SOURCE FILE #13
                                        .TITLE  $FCL02
                                        .IFDF   CNDS21
                                        .GLOBL  $FCALL
                                        R00=%0
                                        R40=%4
                                        R50=%5
                                        SP0=%6
                                $FCALL: MOV     @RET$21,-(SP)
                                        MOV     #137,-(SP)
                                        MOV     R5,-(SP)
                                        MOV     #401,-(SP)
                                        MOV     SP,R5
                                        JSR     R0,@R4
                                RET$21: ADD     #8.,SP
                                        JMP     @(SP)+
                                        .ENDC
                                        .TITLE  $FIX02
                                        .IFDF   CNDS22
                                        .GLOBL  IFIX,$R1,$POLSH
                                        R00=%0
                                        R40=%4
                                        R50=%5
                                        SP0=%6
                                IFIX:   MOV     2(R5),R4
                                        MOV     2(R4),-(SP)
                                        MOV     @R4,-(SP)
                                RND$22: JSR     R4,$POLSH
                                        .WORD   $R1,UPL$22
                                UPL$22: MOV     (SP)+,R0
                                        RTS     R5
                                        .ENDC
                                        .TITLE  $FLT02
                                        .IFDF   CNDS23
                                        .GLOBL  FLOAT,$IR,$POLSH,$POPRS
                                        R00=%0
                                        R10=%1
                                        R40=%4
                                        R50=%5
                                        SP0=%6
                                FLOAT:  MOV     @2(R5),-(SP)
                                        JSR     R4,$POLSH
                                        .WORD   $IR
                                        .WORD   $POPR3
                                        .WORD   UPL$23
                                UPL$23: RTS     R5
                                        .ENDC
                                        .TITLE  $ICI02
                                        .IFDF   CNDS24
                                        .GLOBL  $ICI,$OCI
                                        R00=%0
                                        R10=%1
                                        R20=%2
                                        SP0=%6
                                        PC0=%7
```

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```
                                $OCI:   MOV     #67,-(SP)
                                        BR      GO$24
                                $ICI:   MOV     #471,-(SP)
                                GO$24:  MOV     R1,-(SP)
                                        MOV     8.(SP),R1
                                        ADD     6(SP),8.(SP)
                                        MOV     4(SP),6(SP)
                                        MOV     R0,4(SP)
                                        MOV     R2,-(SP)
                                        CLR     -(SP)
                                        CLR     R0
                                ST?$24: MOVB    (R1)+,R2
                                        BIC     #177600,R2
                                        CMPB    R2,#'
                                        BNE     SGS$24
                                        CMP     R1,12.(SP)
                                        BLT     ST?$24
                                        BR      SGN$24
                                SGS$24: TSTB    7(SP)
                                        BNE     SN[$24
                                        INC     @SP
                                        BR      NCK$24
                                SN[$24: CMPB    R2,#'+
                                        BEQ     FLO$24
                                        CMPB    R2,#'-
                                        BNE     NCK$24
                                        INC     @SP
                                        BR      FLO$24
                                NX?$24: MOVB    (R1)+,R2
                                        BIC     #177600,R2
                                        CMPB    R2,#'
                                        BNE     NCK$24
                                        MOVB    #60,R2
                                NCK$24: CMPB    R2,#'0
                                        BLT     ERR$24
                                        CMPB    R2,6(SP)
                                        BGT     ERR$24
                                        SUB     #60,R2
                                        TSTB    7(SP)
                                        BEQ     OCL$24
                                        ASL     R0
                                        BVS     ERR$24
                                        SUB     R0,R2
                                        ASL     R0
                                        BVS     ERR$24
                                        ASL     R0
                                        BVS     ERR$24
                                        SUB     R2,R0
                                        BVS     ERR$24
                                FLO$24: CMP     R1,12.(SP)
                                        BLT     NX?$24
                                SGN$24: ROR     (SP)+
                                        BCS     ONE$24
                                        NEG     R0
                                        BVS     NOM$24
```

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```
                                        CLC
                                ONES24: MOV     (SP)+,R2
                                        MOV     (SP)+,R1
                                        ROL     (SP)+
                                        MOV     R0,4(SP)
                                        MOV     (SP)+,R0
                                        RTS     PC
                                ERRS24: TST     (SP)+
                                NGMS24: CLR     R0
                                        COM     4(SP)
                                        BR      ONES24
                                OGLS24: ROL     R0
                                        BCS     ERRS24
                                        ROL     R0
                                        BCS     ERRS24
                                        ROL     R0
                                        BCS     ERRS24
                                        ADD     R2,R0
                                        BR      FLOS24
                                        .ENDC
                                        .TITLE  SICO02
                                        .IFDF   ONOS25

                                        .GLOBL  SICO,SOCO
                                        R0=%0
                                        R1=%1
                                        R2=%2
                                        R3=%3
                                        R4=%4
                                        SP=%6
                                        PC=%7
                                SOCO:   MOV     #OCTS25-RELS25,R0
                                        BR      GOS25
                                SICO:   MOV     #DECS25-RELS25,R0
                                GOS25:  MOV     R4,-(SP)
                                        MOV     0,(SP),R3
                                        MOV     4,(SP),R2
                                        BGE     LPSS25
                                        CLR     R2
                                        CLR     4(SP)
                                LPSS25: MOV     4,(SP),R4
                                        MOV     #' ,-(SP)
                                        CMP     R0,#OCTS25-RELS25
                                        BEQ     POSS25
                                        TST     R4
                                        BGE     POSS25
                                        NEG     R4
                                        MOV     #'-,@SP
                                POSS25: CLR     -(SP)
                                        ADD     PC,R0
                                RELS25:
                                TSTS25: TST     @R0
                                        BEQ     MOVS25
                                        CLR     R1
                                SUBS25: SUB     @R0,R4
```

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```
                                        BLO     BACS25
                                        INC     R1
                                        BR      SUBS25
                                BACS25: ADD     (R0)+,R4
                                        TST     R1
                                        BNE     NZES25
                                        TST     @SP
                                        BEQ     TSTS25
                                NZES25: ADD     #60,R1
                                        MOV     R1,-(SP)
                                        BR      TSTS25
                                MOVS25: ADD     R2,R3
                                        ADD     #60,R4
                                        MOVB    R4,-(R3)
                                OCRS25: DEC     R2
                                        BLE     FULS25
                                        MOVB    (SP)+,-(R3)
                                        BNE     OCRS25
                                        MOVB    (SP)+,@R3
                                FILS25: DEC     R2
                                        BEQ     ONES25
                                        MOVB    #' ,-(R3)
                                        BR      FILS25
                                FULS25: TST     (SP)+
                                        BNE     ERRS25
                                        CMP     #' ,(SP)+
                                        BNE     STSS25-4,
                                ONES25: MOV     (SP)+,R4
                                        MOV     (SP)+,4(SP)
                                        TST     (SP)+
                                        ROL     (SP)+
                                        RTS     PC
                                ERRS25: TST     (SP)+
                                        BNE     ERRS25
                                        TST     (SP)+
                                        MOV     6,(SP),R3
                                STSS25: MOVB    #'0,(R3)+
                                        DEC     6(SP)
                                        BGT     STSS25
                                        COM     6(SP)
                                        BR      ONES25
                                DECS25: .WORD   10000.,1000.,100.,10.,0
                                OCTS25: .WORD   100000,10000,1000,100,10,0
                                        .ENDC
                                        .TITLE  SINT02
                                        .IFDF   ONOS24
                                        .GLOBL  INT,IQINT,$RI,$POLSH
                                        R0=%0
                                        R4=%4
                                        R5=%5
                                        SP=%6
                                INT:
                                IQINT:  MOV     2(R5),R4
                                        MOV     2(R4),-(SP)
                                        MOV     @R4,-(SP)
```

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```
                                        JSR     R4,$POLSH
                                        .WORD   $R1,UPLS26
                                UPLS26: MOV     (SP)+,R0
                                        RTS     R5
                                        .ENDC
                                        .TITLE  SIR04
                                        .IFDF   CND$27
                                        .GLOBL  SIR
                                        .IFNDF  $BAS
                                        .GLOBL  SIO
                                        .ENDC
                    000000              R0=%0
                    000001              R1=%1
                    000002              R2=%2
                    000003              R3=%3
                    000004              R4=%4
                    000006              SP=%6
                    177304              MQ=177304
                    177312              NOR=177312
                    000000              F0=%0
                                        .IFDF   FPU
                                        .IFNDF  $BAS
                                SIO:    SETD
                                        BR      IO1$27
                                                        .ENDC
                                SIR:    SETF
                                IO1$27: SETI
                                        LDCIF   (SP)+,F0
                                        STF     F0,-(SP)
                                        JMP     @(R4)+
                                        .ENDC
                                        .IFNDF  FPU
                                        .IFNDF  $BAS
                                SIO:    MOV     @SP,-(SP)
                                        MOV     @SP,-(SP)
                                        CLR     2(SP)
                                        CLR     4(SP)
                                        .ENDC
002236' 005046                  SIR:    CLR     -(SP)
002240' 016601  000002                  MOV     2(SP),R1
002244' 003002                          BGT     POS$27
002246' 001424                          BEQ     ERR$27
002250' 005401                          NEG     R1
002252' 006146                  POS$27: ROL     -(SP)
                                        .IFNDF  EAE
002254' 012702  000220                  MOV     #220,R2
                                        .ENDC
                                        .IFDF   EAE
                                        MOV     #217,R2
```

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```
                                        .ENDC
002260' 105066  000004                  CLRB    4(SP)
                                NOM$27:
                                        .IFNDF  EAE
002264' 006101                          ROL     R1
002266' 103402                          BCS     NOD$27
002270' 005302                          DEC     R2
002272' 000774                          BR      NOM$27
                                        .ENDC
                                        .IFDF   EAE
                                        MOV     #MQ,R3
                                        CLR     @R3
                                        MOV     R1,-(R3)
                                        MOV     #NOR,R0
                                        CLR     @R0
                                        SUB     (R0)+,R2
                                        MOV     #2,@R0
                                        MOV     @R3,R1
                                        .ENDC
002274' 110166  000005          NOD$27: MOVB    R1,5(SP)
002300' 105001                          CLRB    R1
002302' 150201                          BISB    R2,R1
002304' 000301                          SWAB    R1
002306' 006026                          ROR     (SP)+
002310' 006001                          ROR     R1
002312' 106066  000003                  RORB    3(SP)
002316' 010116                          MOV     R1,@SP
002320' 000134                  ERS27:  JMP     @(R4)+
                                        .ENDC
                                        .ENDC
                                        .TITLE  SMLD05
                                        .IFDF   CND$20
                                        .GLOBL  SMLD,$ERRA
                                        R0=%0
                                        R1=%1
                                        R2=%2
                                        R3=%3
                                        R4=%4
                                        R5=%5
                                        SP=%6
                                        PC=%7
                                        MQ=177304
                                        A=0.
                                        B=16.
                                        RESLT=12.
                                        SIGN=2
                                        F0=%0
                                        .IFDF   FPU
                                SMLD:   .WORD   170011
                                        .WORD   172420
                                        .WORD   171020
                                        .WORD   174040
                                        JMP     @(R4)+
                                        .ENDC
                                        .IFNDF  FPU
```

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```
4125                                SMLD1:  MOV     R4,-(SP)
4126                                        MOV     R5,-(SP)
4127                                        ASL     A+6-4(SP)
4128                                        ROL     -(SP)
4129                                        CLR     -(SP)
4130                                        MOVB    A+1(SP),-SP
4131                                        BEQ     ZERS28
4132                                        MOVB    A(SP),A+1(SP)
4133                                        SEC
4134                                        ROR     A(SP)
4135                                        MOVB    A+3(SP),A(SP)
4136                                        SWAB    A+2(SP)
4137                                        MOVB    A+5(SP),A+2(SP)
4138                                        SWAB    A+4(SP)
4139                                        MOVB    A+7(SP),A+4(SP)
4140                                        SWAB    A+6(SP)
4141                                        CLRB    A+6(SP)
4142                                        ASL     B(SP)
4143                                        ADC     SIGN(SP)
4144                                        TSTB    B+1(SP)
4145                                        BNE     NNES28
4146                                ZERS28: CMP     (SP)+,(SP)+
4147                                ZES528: JMP     ZES2S28
4148                                NNES28: CLR     R0
4149                                        CLR     R1
4150                                        .IFNDF  EAE&MULDIV
4151                                        CLR     R2
4152                                        CLR     R3
4153                                        CLR     R4
4154                                        ROR     B(SP)
4155                                        MOV     #16.,-(SP)
4156                                        MOV     B+6+2(SP),R4
4157                                        BEQ     B4ES28
4158                                        JSR     PC,MT0S28
4159                                        MOV     #16.,-SP
4160                                B4ES28: MOV     B+4+2(SP),R4
4161                                        BNE     B4NS28
4162                                        TST     B+6+2(SP)
4163                                        BEQ     B4ES28
4164                                B4NS28: JSR     PC,MT2S28
4165                                        JSR     PC,MLTS28
4166                                        MOV     #16.,-SP
4167                                B4ES28: MOV     B+2+2(SP),R4
4168                                        BNE     B2NS28
4169                                        TST     B+4+2(SP)
4170                                        BNE     B2NS28
4171                                        TST     B+6+2(SP)
4172                                        BEQ     B2ES28
4173                                B2NS28: JSR     PC,MLTS28
4174                                B2ES28: MOV     B+0+2(SP),R4
4175                                        MOV     #7,-SP
4176                                        JSR     PC,MLTS28
4177                                        JSR     PC,MT1S28
4178                                        TST     (SP)+
4179                                        ADD     (SP)+,R4
```

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```
4180                                        .ENDC
4181                                        .IFDF   EAE!MULDIV
4182                                        CLR     R4
4183                                        BISB    B+1(SP),R4
4184                                        ADD     R4,-SP
4185                                        MOVB    #1,B+1(SP)
4186                                        ROR     B(SP)
4187                                        SWAB    B(SP)
4188                                        MOVB    B+3(SP),B(SP)
4189                                        SWAB    B+2(SP)
4190                                        MOVB    B+5(SP),B+2(SP)
4191                                        SWAB    B+4(SP)
4192                                        MOVB    B+7(SP),B+4(SP)
4193                                        SWAB    B+6(SP)
4194                                        CLRB    B+6(SP)
4195                                        .ENDC
4196                                        .IFDF   EAE
4197                                        MOV     #MQ,R4
4198                                        MOV     A(SP),-(SP)
4199                                        MOV     B+4+2(SP),@R4
4200                                        JSR     R5,EMUS28
4201                                        MOV     (SP)+,R2
4202                                        MOV     (SP)+,R3
4203                                        MOV     A+2(SP),-(SP)
4204                                        MOV     B+4+2(SP),@R4
4205                                        JSR     R5,EMUS28
4206                                        ADD     (SP)+,R2
4207                                        ADC     R1
4208                                        ADD     (SP)+,R3
4209                                        ADC     R2
4210                                        ADC     R1
4211                                        MOV     A+4(SP),-(SP)
4212                                        MOV     B+2+2(SP),@R4
4213                                        JSR     R5,EMUS28
4214                                        ADD     (SP)+,R2
4215                                        ADC     R1
4216                                        ADD     (SP)+,R3
4217                                        ADC     R2
4218                                        ADC     R1
4219                                        MOV     A+6(SP),-(SP)
4220                                        MOV     B+0+2(SP),@R4
4221                                        JSR     R5,EMUS28
4222                                        ADD     (SP)+,R2
4223                                        ADC     R1
4224                                        ADD     (SP)+,R3
4225                                        ADC     R2
4226                                        ADC     R1
4227                                        MOV     R2,R3
4228                                        MOV     R1,R2
4229                                        CLR     R1
4230                                        MOV     A(SP),-(SP)
4231                                        MOV     B+4+2(SP),@R4
4232                                        JSR     R5,EMUS28
4233                                        ADD     (SP)+,R2
4234                                        ADC     R1
```

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```
4235                                    ADD     (SP)+,R3
4236                                    ADC     R2
4237                                    ADC     R1
4238                                    MOV     A+2(SP),-(SP)
4239                                    MOV     B+2+2(SP),@R4
4240                                    JSR     R5,EMUS28
4241                                    ADD     (SP)+,R2
4242                                    ADC     R1
4243                                    ADD     (SP)+,R3
4244                                    ADC     R2
4245                                    ADC     R1
4246                                    MOV     A+4(SP),-(SP)
4247                                    MOV     B+0+2(SP),@R4
4248                                    JSR     R5,EMUS28
4249                                    ADD     (SP)+,R2
4250                                    ADC     R1
4251                                    ADD     (SP)+,R3
4252                                    ADC     R2
4253                                    ADC     R1
4254                                    MOV     A(SP),-(SP)
4255                                    MOV     B+2+2(SP),@R4
4256                                    JSR     R5,EMUS28
4257                                    ADD     (SP)+,R1
4258                                    ADC     R0
4259                                    ADD     (SP)+,R2
4260                                    ADC     R1
4261                                    ADC     R0
4262                                    MOV     A+2(SP),-(SP)
4263                                    MOV     B+0+2(SP),@R4
4264                                    JSR     R5,EMUS28
4265                                    ADD     (SP)+,R1
4266                                    ADC     R0
4267                                    ADD     (SP)+,R2
4268                                    ADC     R1
4269                                    ADC     R0
4270                                    MOV     A(SP),-(SP)
4271                                    MOV     B+0+2(SP),@R4
4272                                    JSR     R5,EMUS28
4273                                    ADD     (SP)+,R0
4274                                    ADD     (SP)+,R1
4275                                    ADC     R0
4276                                    MOV     (SP)+,R4
4277                                    .ENDC
4278                                    .IFDF   MVLDIV
4279                                    MOV     A(SP),-(SP)
4280                                    MOV     B+4+2(SP),R4
4281                                    JSR     PC,EMUS28
4282                                    MOV     R4,R2
4283                                    MOV     R5,R3
4284                                    MOV     A+2(SP),-(SP)
4285                                    MOV     B+4+2(SP),R4
4286                                    JSR     PC,EMUS28
4287                                    ADD     R4,R2
4288                                    ADC     R1
4289                                    ADD     R5,R3
```

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```
4290                                    ADC     R2
4291                                    ADC     R1
4292                                    MOV     A+4(SP),-(SP)
4293                                    MOV     B+2+2(SP),R4
4294                                    JSR     PC,EMUS28
4295                                    ADD     R4,R2
4296                                    ADC     R1
4297                                    ADD     R5,R3
4298                                    ADC     R2
4299                                    ADC     R1
4300                                    MOV     A+6(SP),-(SP)
4301                                    MOV     B+0+2(SP),R4
4302                                    JSR     PC,EMUS28
4303                                    ADD     R4,R2
4304                                    ADC     R1
4305                                    ADD     R5,R3
4306                                    ADC     R2
4307                                    ADC     R1
4308                                    MOV     R2,R3
4309                                    MOV     R1,R2
4310                                    CLR     R1
4311                                    MOV     A(SP),-(SP)
4312                                    MOV     B+4+2(SP),R4
4313                                    JSR     PC,EMUS28
4314                                    ADD     R4,R2
4315                                    ADC     R1
4316                                    ADD     R5,R3
4317                                    ADC     R2
4318                                    ADC     R1
4319                                    MOV     A+2(SP),-(SP)
4320                                    MOV     B+2+2(SP),R4
4321                                    JSR     PC,EMUS28
4322                                    ADD     R4,R2
4323                                    ADC     R1
4324                                    ADD     R5,R3
4325                                    ADC     R2
4326                                    ADC     R1
4327                                    MOV     A+4(SP),-(SP)
4328                                    MOV     B+0+2(SP),R4
4329                                    JSR     PC,EMUS28
4330                                    ADD     R4,R2
4331                                    ADC     R1
4332                                    ADD     R5,R3
4333                                    ADC     R2
4334                                    ADC     R1
4335                                    MOV     A(SP),-(SP)
4336                                    MOV     B+2+2(SP),R4
4337                                    JSR     PC,EMUS28
4338                                    ADD     R4,R1
4339                                    ADC     R0
4340                                    ADD     R5,R2
4341                                    ADC     R1
4342                                    ADC     R0
4343                                    MOV     A+2(SP),-(SP)
4344                                    MOV     B+0+2(SP),R4
```

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```
4345                                    JSR     PC,EMUS28
4346                                    ADD     R4,R1
4347                                    ADC     R0
4348                                    ADD     R5,R2
4349                                    ADC     R1
4350                                    ADC     R0
4351                                    MOV     A(SP),-(SP)
4352                                    MOV     B+0+2(SP),R4
4353                                    JSR     PC,EMUS28
4354                                    ADD     R4,R0
4355                                    ADD     R5,R1
4356                                    ADC     R0
4357                                    MOV     (SP)+,R4
4358                                    .ENDC
4359                                    ASL     R3
4360                                    ROL     R2
4361                                    ROL     R1
4362                                    ROL     R0
4363                                    BCS     NOMS28
4364                                    ASL     R3
4365                                    ROL     R2
4366                                    ROL     R1
4367                                    ROL     R0
4368                                    DEC     R4
4369                            NOMS28: SUB     #200,R4
4370                                    BLE     UNDS28
4371                                    CMP     #377,R4
4372                                    BLT     OVRS28
4373                                    CLRB    R3
4374                                    BISB    R2,R3
4375                                    SWAB    R3
4376                                    CLRB    R2
4377                                    BISB    R1,R2
4378                                    SWAB    R2
4379                                    CLRB    R1
4380                                    BISB    R0,R1
4381                                    SWAB    R1
4382                                    CLRB    R0
4383                                    BISB    R4,R0
4384                                    SWAB    R0
4385                                    ROR     (SP)+
4386                                    ROR     R0
4387                                    ROR     R1
4388                                    ROR     R2
4389                                    ROR     R3
4390                                    ADC     R3
4391                                    ADC     R2
4392                                    ADC     R1
4393                                    ADC     R0
4394                                    BCS     OV1S28
4395                                    BVS     OV1S28
4396                            OUTS28: MOV     R0,RESULT(SP)
4397                                    MOV     R1,RESULT+2(SP)
4398                                    MOV     R2,RESULT+4(SP)
4399                                    MOV     R3,RESULT+6(SP)
```

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```
4400                                    MOV     (SP)+,R5
4401                                    MOV     (SP)+,R4
4402                                    ADD     #8.,SP
4403                                    JMP     @(R4)+
4404                            OVIS28: TST     -(SP)
4405                            OVRS28: MOV     #32767,R0
4406                                    SR      ECLS28
4407                            UNDS28: MOV     #32768,R0
4408                            ECLS28: TST     (SP)+
4409                                    JSR     R5,$ERRA
4410                            ZE2S28: CLR     R0
4411                                    CLR     R1
4412                                    CLR     R2
4413                                    CLR     R3
4414                                    BR      OUTS28
4415                                    .IFNDF  EAE&MULDIV
4416                            MLTS28: ASR     R4
4417                                    BCC     X8S28
4418                            MT1S28: ADD     A+6+4(SP),R3
4419                                    ADC     R2
4420                                    ADC     R1
4421                                    ADC     R0
4422                                    ADC     R5
4423                                    ADD     A+4+4(SP),R2
4424                                    ADC     R1
4425                                    ADC     R0
4426                                    ADC     R5
4427                                    ADD     A+2+4(SP),R1
4428                                    ADC     R0
4429                                    ADC     R5
4430                                    ADD     A+0+4(SP),R0
4431                                    ADC     R5
4432                            X8S28:  ASR     R5
4433                                    ROR     R0
4434                                    ROR     R1
4435                                    ROR     R2
4436                                    ROR     R3
4437                                    DEC     2(SP)
4438                                    BGT     MLTS28
4439                                    RTS     PC
4440                            MT2S28: DEC     2(SP)
4441                            MT8S28: ASR     R4
4442                                    BCC     X88S28
4443                                    ADD     A+2+4(SP),R1
4444                                    ADC     R0
4445                                    ADC     R5
4446                                    ADD     A+0+4(SP),R0
4447                                    ADC     R5
4448                            X88S28: ASR     R5
4449                                    ROR     R0
4450                                    ROR     R1
4451                                    ROR     R2
4452                                    ROR     R3
4453                                    DEC     2(SP)
4454                                    BGT     MT8S28
```

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```
                                        RTS     PC
                                        .ENDC
                                        .IFDF   EAE
                                EMUS28: CLR     @SP
                                        TST     @R4
                                        BEQ     MZS28
                                        BGT     MPLS28
                                        TST     2(SP)
                                        BEQ     MZS28
                                        BGT     MNGS28
                                        ADD     (R4)+,@SP
                                        ADD     2(SP),@SP
                                        BR      EMLS28
                                MPLS28: TST     2(SP)
                                        BEQ     MZS28
                                        BGT     MLQS28
                                        ADD     (R4)+,@SP
                                        BR      EMLS28
                                MNGS28: ADD     2(SP),@SP
                                MLQS28: TST     (R4)+
                                EMLS28: MOV     2(SP),@R4
                                        MOV     -(R4),2(SP)
                                        ADD     -(R4),@SP
                                        TST     (R4)+
                                        JMP     @R5
                                MZS28:  CLR     2(SP)
                                        JMP     @R5
                                        .ENDC
                                        .IFDF   MULDIV
                                EMUS28: CLR     -(SP)
                                        TST     R4
                                        BEQ     MZS28
                                        BGT     MPLS28
                                        TST     4(SP)
                                        BEQ     MZS28
                                        BGT     MNLS28
                                        BR      MNGS28
                                MPLS28: TST     4(SP)
                                        BEQ     MZS28
                                        BGT     MLQS28
                                        ADD     R4,@SP
                                        BR      MLQS28
                                MNGS28: ADD     R4,@SP
                                MNLS28: ADD     4(SP),@SP
                                MLQS28: .WORD   070466,4
                                MQNS28: ADD     (SP)+,R4
                                        MOV     (SP)+,@SP
                                        RTS     PC
                                MZS28:  CLR     R4
                                        CLR     R5
                                        BR      MQNS28
                                        .ENDC
                                        .ENDC
                                        .ENDC
                                        .TITLE  SML105
```

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```
                                        .IFDF   CND529
                                        .GLOBL  SML1,$ERR
                                        R0=%0
                                        R1=%1
                                        R2=%2
                                        R3=%3
                                        R4=%4
                                        R5=%5
                                        SP=%6
                                        $RS29=177711
                                        MQ=177304
                                        .IFNDF  EAE&MULDIV
                                SML1:   CLR     R0
                                        MOV     (SP)+,R1
                                        BGT     P1S29
                                        BEQ     ZERS29
                                        INC     R0
                                        NEG     R1
                                P1S29:  MOV     @SP,R3
                                        BGT     P2S29
                                        BEQ     ZERS29
                                        INC     R0
                                        NEG     R3
                                P2S29:  MOV     R4,-(SP)
                                        MOV     #0,R4
                                        CMP     R1,R3
                                        BGE     CLRS29
                                        MOV     R1,R2
                                        MOV     R3,R1
                                        MOV     R2,R3
                                CLRS29: CLR     R2
                                MULS29: ROR     R2
                                        ROR     R3
                                        BCC     CYCS29
                                        ADD     R1,R2
                                CYCS29: DEC     R4
                                        BGT     MULS29
                                        MOV     (SP)+,R4
                                        TSTB    R3
                                        BNE     OVRS29
                                        BISB    R2,R3
                                        SWAB    R3
                                        CLRB    R2
                                        SWAB    R2
                                        ASR     R2
                                        BNE     OVRS29
                                        ROR     R3
                                        NEG     R3
                                        BPL     OVRS29
                                        ROR     R0
                                        BCS     OUTS29
                                        NEG     R3
                                        BVS     OVRS29
                                OUTS29: MOV     R3,@SP
                                        JMP     @(R4)+
```

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```
                                NGMS29: NEG     R3
                                        BVC     OVRS29
                                        ROR     R0
                                        BCS     OUTS29
                                        BR      OVRS29
                                EERS29: CLR     @SP
                                        JMP     @(R4)+
                                        .ENDC
                                        .IFDF   EAE
                                SMLI:   MOV     #MQ,R0
                                        MOV     (SP)+,(R0)+
                                        MOV     (SP)+,@R0
                                        MOV     -(R0),-(SP)
                                        BITB    #2,SR@29
                                        BEQ     OVRS29
                                        JMP     @(R4)+
                                        .ENDC
                                        .IFDF   MULDIV
                                SMLI:   MOV     (SP)+,R0
                                        .WORD   @70020
                                        MOV     R1,-(SP)
                                        BCS     OVRS29
                                        JMP     @(R4)+
                                        .ENDC
                                OVRS29: CLR     (SP)
                                        JSR     R5,$ERR
                                        JMP     @(R4)+
                                        .BYTE   3
                                        .BYTE   14.
                                        .ENDC
                                        .TITLE  SMLR05
                                        .IFDF   CND$30
                                        .GLOBL  SMLR,$ERRA
          000000                        R0=X0
          000001                        R1=X1
          000002                        R2=X2
          000003                        R3=X3
          000004                        R4=X4
          000005                        R5=X5
          000006                        SP=X6
          000007                        PC=X7
          177304                        MQ=177304
          177311                        SR=177311
          177314                        LSH=177314
          000000                        FP=X0
          000010                        A=8.
          000014                        B=12.
          000010                        RESLT=8.
          000002                        SIGN=2
                                        .IFDF   FPU
                                SMLR1:  .WORD   170001
                                        .WORD   172420
                                        .WORD   171020
                                        .WORD   174040
                                        JMP     @(R4)+
```

465 A


```
                                        .ENDC
                                        .IFNDF  FPU
002322' 010446                  SMLR1:  MOV     R4,-(SP)
002324' 010546                          MOV     R5,-(SP)
                                        .IFNDF  EAE&MULDIV
002326' 016602  000004                  MOV     A+@-4(SP),R2
002332' 006302                          ASL     R2
002334' 006146                          ROL     -(SP)
002336' 005046                          CLR     -(SP)
002340' 000302                          SWAB    R2
002342' 110216                          MOVB    R2,@SP
002344' 001507                          BEQ     EE1$30
002346' 000261                          SEC
002350' 006002                          ROR     R2
002352' 105002                          CLRB    R2
002354' 156602  000013                  BISB    A+3(SP),R2
002360' 005003                          CLR     R3
002362' 156603  000012                  BISB    A+2(SP),R3
002366' 000303                          SWAB    R3
002370' 006366  000014                  ASL     B(SP)
002374' 005566  000002                  ADC     SIGN(SP)
002400' 105766  000015                  TSTB    B+1(SP)
002404' 001467                          BEQ     EE1$30
002406' 006066  000014                  ROR     B(SP)
002412' 005000                          CLR     R0
002414' 005001                          CLR     R1
002416' 016604  000010                  MOV     B+2(SP),R4
002422' 001436                          BEQ     B2E$30
002424' 012705  000017          B2NS30: MOV     #15.,R5
002430' 004767  000220                  JSR     PC,MT@$30
002434' 004767  000160                  JSR     PC,MLT$30
002440' 016604  000014          B2E$30: MOV     B(SP),R4
002444' 012705  000007                  MOV     #7,R5
002450' 004767  000144                  JSR     PC,MLT$30
002454' 004767  000144                  JSR     PC,MT1$30
002460' 062604                          ADD     (SP)+,R4
                                        .ENDC
                                        .IFDF   EAE
                                        MOV     #MQ,R4
                                        MOV     #100000,R5
                                        MOV     B+2+4(SP),@R4
                                        MOV     B+@-4(SP),-(R4)
                                        BEQ     EER$30
                                        INC     @@LSH
                                        RORB    @@SR
                                        ROL     -(SP)
                                        MOV     (R4)+,-(SP)
                                        CLRB    @SP
                                        SWAB    @SP
                                        MOV     #7,@@LSH
                                        MOV     @R4,-(SP)
                                        BIS     R5,-(R4)
                                        MOV     (R4)+,-(SP)
                                        MOV     A+2+4(SP),@R4
                                        MOV     A+@+4(SP),-(R4)
```

466

```
                                        BEQ     $E2$30
                                        INC     @#L$M
                                        RORB    @#$R
                                        ADC     6(SP)
                                        MOV     @R4,R3
                                        CLRB    R3
                                        SWAB    R3
                                        ADD     R3,4(SP)
                                        MOV     #7,@#L$M
                                        MOV     (R4)+,R2
                                        BIS     R3,R2
                                        CLR     R0
                                        CLR     R1
                                        MOV     (R4)+,R3
                                        BNE     A2N$30
                                        TST     -(R4)
                                        BR      A2E$30
                                A2N$30: MOV     @SP,@R4
                                        CMP     -(R4),-(R4)
                                        ADD     R3,@R4
                                        TST     R3
                                        BPL     A2P$30
                                        ADD     @SP,@R4
                                A2P$30: MOV     (R4)+,R1
                                A2E$30: MOV     2(SP),(R4)+
                                        BNE     B2N$30
                                        TST     -(R4)
                                        BR      B2E$30
                                B2N$30: MOV     R2,@R4
                                        CMP     -(R4),-(R4)
                                        ADD     2(SP),@R4
                                        TST     2(SP)
                                        BPL     B2P$30
                                        ADD     R2,@R4
                                B2P$30: ADD     (R4)+,R1
                                        ADC     R0
                                B2E$30: MOV     R2,(R4)+
                                        ADD     R2,R0
                                        MOV     @SP,@R4
                                        ADD     (SP)+,R0
                                        ADD     -(R4),R1
                                        ADC     R0
                                        ADD     -(R4),R0
                                        TST     (SP)+
                                        MOV     (SP)+,R4
                                        .ENDC
                                        .IFDF   MUL$DIV
                                        MOV     $+2-4(SP),R5
                                        MOV     $+6-4(SP),R4
                                        BEQ     $ER$30
                                        .WORD   $73427,1
                                        ROL     -(SP)
                                        MOV     R4,-(SP)
                                        CLRB    @SP
                                        SWAB    @SP
```

467


```
                                        .WORD   $73427,7
                                        MOV     R5,-(SP)
                                        BIS     #100000,R4
                                        MOV     R4,-(SP)
                                        MOV     A+2+4(SP),R3
                                        MOV     A+0+4(SP),R2
                                        BEQ     $E2$30
                                        .WORD   $73227,1
                                        ADC     4(SP)
                                        MOV     R2,R0
                                        CLRB    R0
                                        SWAB    R0
                                        ADD     R0,4(SP)
                                        .WORD   $73227,7
                                        BIS     #100000,R2
                                        CLR     R0
                                        CLR     R1
                                        TST     R3
                                        BEQ     A2E$30
                                        .WORD   $70403
                                        ADD     R3,R4
                                        TST     R3
                                        BPL     A2P$30
                                        ADD     @SP,R4
                                A2P$30: MOV     R4,R1
                                A2E$30: MOV     2(SP),R4
                                        BEQ     B2E$30
                                        .WORD   $70402
                                        ADD     2(SP),R4
                                        TST     2(SP)
                                        BPL     B2P$30
                                        ADD     R2,R4
                                B2P$30: ADD     R4,R1
                                        ADC     R0
                                B2E$30: MOV     R2,R4
                                        ADD     R2,R0
                                        .WORD   $70410
                                        ADD     (SP)+,R0
                                        ADD     R5,R1
                                        ADC     R0
                                        ADD     R4,R0
                                        TST     (SP)+
                                        MOV     (SP)+,R4
                                        .ENDC
002462' 006101                          ROL     R1
002464' 006100                          ROL     R0
002466' 103403                          BCS     NOM$30
002470' 006101                          ROL     R1
002472' 006100                          ROL     R0
002474' 005304                          DEC     R4
002476' 162704  000200          NOM$30: SUB     #200,R4
002502' 003436                          BLE     UNO$30
002504' 022704  000377                  CMP     #377,R4
002510' 002427                          BLT     OVR$30
002512' 105001                          CLRB    R1
```

468

```
 4785  002514' 150001          .                BISB    R0,R1
 4786  002516' 006301                           SWAB    R1
 4787  002520' 105000                           CLRB    R0
 4788  002522' 150400                           BISB    R4,R0
 4789  002524' 006300                           SWAB    R0
 4790  002526' 006026                           ROR     (SP)+
 4791  002530' 006000                           ROR     R0
 4792  002532' 006001                           ROR     R1
 4793  002534' 005501                           ADC     R1
 4794  002536' 005500                           ADC     R0
 4795  002540' 103414                           BCS     OVI$3@
 4796  002542' 102413                           BVS     OVI$3@
 4797  002544' 010066  000010          OUT$3@:  MOV     R0,RES$LT(SP)
 4798  002550' 010166  000012                   MOV     R1,RES$LT+2(SP)
 4799  002554' 012605                           MOV     (SP)+,R5
 4800  002556' 012604                           MOV     (SP)+,R4
 4801  002560' 022626                           CMP     (SP)+,(SP)+
 4802  002562' 000134                           JMP     @(R4)+
 4803                                           .IFDF   EAE!MVL$DIV
 4804                                  EE2$3@:  CMP     (SP)+,(SP)+
 4805                                           .ENDC
 4806  002564' 022626                  EE1$3@:  CMP     (SP)+,(SP)+
 4807  002566' 000411                           BR      EER$3@
 4808  002570' 005726                  OVR$3@:  TST     (SP)+
 4809  002572' 012700  000003          OVI$3@:  MOV     #3@@3,R0
 4810  002576' 000403                           BR      ECL$3@
 4811  002600' 012700  003405          UNO$3@:  MOV     #3405,R0
 4812  002604' 005726                           TST     (SP)+
 4813  002606' 004567  001436          ECL$3@:  JSR     R5,SERRA
 4814  002612' 005000                  EER$3@:  CLR     R0
 4815  002614' 005001                           CLR     R1
 4816  002616' 000752                           BR      OUT$3@
 4817                                           .IFNDF  EAE&MVL$DIV
 4818  002620' 006204                  MLT$3@:  ASR     R4
 4819  002622' 103004                           BCC     X@$3@
 4820  002624' 060301                  MTI$3@:  ADD     R3,R1
 4821  002626' 005500                           ADC     R0
 4822  002630' 103406                           BCS     COV$3@
 4823  002632' 060200                           ADD     R2,R0
 4824  002634' 006000                  X@$3@:   ROR     R0
 4825  002636' 006001                           ROR     R1
 4826  002640' 005305                           DEC     R5
 4827  002642' 003366                           BGT     MLT$3@
 4828  002644' 000207                           RTS     PC
 4829  002646' 060200                  COV$3@:  ADD     R2,R0
 4830  002650' 000261                           SEC
 4831  002652' 000770                           BR      X@$3@
 4832  002654' 006204                  MT@$3@:  ASR     R4
 4833  002656' 103001                           BCC     X@@$3@
 4834  002660' 060200                           ADD     R2,R0
 4835  002662' 006000                  X@@$3@:  ROR     R0
 4836  002664' 006001                           ROR     R1
 4837  002666' 005305                           DEC     R5
 4838  002670' 003371                           BGT     MT@$3@
 4839  002672' 000207                           RTS     PC
```

469


```
 4840                                           .ENDC
 4841                                           .ENDC
 4842                                           .ENDC
 4843                                           .EOT
 4844
```

470

```
                                        ;                                       BASIC SOURCE FILE #14
                                        ;       .TITLE  $NEG02
                                        ;       .IFDF   CND$31
                                        ;       .GLOBL  $NGI,$NGR,$NGD,$ERR
                                        ;       R4=%4
                                        ;       R5=%5
                                        ;       SP=%6
                                        $NGI:   NEG     @$P
                                                BVS     OVR$31
                                                JMP     @(R4)+
                                        $NGR:
                                        $NGD:   TST     @$P
                                                BEQ     ZER$31
                                                ADD     #100000,@$P
                                        ZER$31: JMP     @(R4)+
                                        OVR$31: JSR     R5,$ERR
                                                JMP     @(R4)+
                                                .BYTE   3
                                                .BYTE   11.
                                                .ENDC
                                                .TITLE  $PHR07
                                                .IFDF   CND$32

                                        R0      =       %0
                                        R1      =       %1
                                        R2      =       %2
                                        R3      =       %3
                                        R4      =       %4
                                        R5      =       %5
                                        SP      =       %6
                                        PC      =       %7
                                                .GLOBL  $PSHR5,$PSHR4,$PSHR3,$PSHR2,$PSHR1
                                        $PSHR5:
                                        $PSHR4: MOV     R3,-(SP)
                                                MOV     R2,-(SP)
                                        $PSHR3: MOV     R1,-(SP)
                                        $PSHR2:
                                        $PSHR1: MOV     R0,-(SP)
                                                JMP     @(R4)+
                                                .ENDC
                                                .TITLE  $PPR04
                                                .IFDF   CND$33
                000000                  R0=%0
                000001                  R1=%1
                000002                  R2=%2
                000003                  R3=%3
                000004                  R4=%4
                000005                  R5=%5
                000006                  SP=%6
                000007                  PC=%7
                                                .GLOBL  $POPR5,$POPR4,$POPR3
                                        $POPR5:
002674' 012600                          $POPR4: MOV     (SP)+,R0
002676' 012601                                  MOV     (SP)+,R1
002700' 012602                                  MOV     (SP)+,R2
```

471


```
002702' 012603                                  MOV     (SP)+,R3
002704' 000134                                  JMP     @(R4)+
002706' 012600                          $POPR3: MOV     (SP)+,R0
002710' 012601                                  MOV     (SP)+,R1
002712' 000134                                  JMP     @(R4)+
                                                .ENDC
                                                .TITLE  $RO02
                                                .IFDF   CND$34
                                                .GLOBL  $RD
                                                R4=%4
                                                SP=%6
                                                F0=%0
                                                F1=%1
                                                .IFDF   FPU
                                        $RDI:   .WORD   170011
                                                .WORD   177420
                                                .WORD   174400
                                                JMP     @(R4)+
                                                .ENDC
                                                .IFNDF  FPU
                                        $RDI:   MOV     2(SP),-(SP)
                                                MOV     2(SP),-(SP)
                                                CLR     4(SP)
                                                CLR     6(SP)
                                                JMP     @(R4)+
                                                .ENDC
                                                .ENDC
                                                .TITLE  $RI04
                                                .IFDF   CND$35
                                                .GLOBL  $RI,$ERR

                                                .IFNDF  $DAS
                                                .GLOBL  $DI
                                                .ENDC

                000000                          R0=%0
                000001                          R1=%1
                000002                          R2=%2
                000003                          R3=%3
                000004                          R4=%4
                000005                          R5=%5
                000006                          SP=%6
                177304                          MQ=177304
                177314                          LSH=177314
                000000                          F0=%0
                                                .IFDF   FPU

                                                .IFNDF  $DAS
                                        $DI:    SETD
                                                BR      RI0$35
                                                .ENDC

                                        $RI:    SETF
                                        RI0$35: SETI
                                                LDD     (SP)+,F0
```

472

```
                                        $TCDI   FP,-(SP)
                                        JMP     @(R4)+
                                        .ENDC
                                        .IFNDF  FPU

                                        .IFNDF  $DA$
                                SDI:    MOV     (SP)+,2(SP)
                                        MOV     (SP)+,2(SP)
                                        .ENDC

 002714' 005002                 SRI:    CLR     R2
 002716' 005202                         INC     R2
 002720' 012601                         MOV     (SP)+,R1
 002722' 006116                         ROL     @SP
 002724' 006101                         ROL     R1
 002726' 006146                         ROL     -(SP)
 002730' 110103                         MOVB    R1,R3
 002732' 105801                         CLRB    R1
 002734' 006301                         SWAB    R1
 002736' 162701  000201                 SUB     #201,R1
 002742' 002433                         BLT     $ERR$35
 002744' 001413                         BEQ     ONE$35
 002746' 022701  000017                 CMP     #15.,R1
 002752' 002422                         BLT     OVR$35
 002754' 000303                         SWAB    R3
 002756' 105803                         CLRB    R3
 002760' 156603  000003                 BISB    3(SP),R3
                                SF*$35:
                                        .IFNDF  EAE&MULDIV
 002764' 006103                         ROL     R3
 002766' 006102                         ROL     R2
 002770' 005301                 DEC$35: DEC     R1
 002772' 003374                         BGT     SF*$35
                                        .ENDC
                                        .IFDF   EAE
                                        MOV     #MQ,R0
                                        MOV     R3,@R0
                                        MOV     R2,-(R0)
                                        MOV     R1,@0LSH
                                        MOV     @R0,R2
                                        .ENDC
                                        .IFDF   MULDIV
                                        .WORD   073201
                                        .ENDC
 002774' 005402                 ONE$35: NEG     R2
 002776' 102406                         BVS     NGM$35
 003000' 003007                         BGT     OVR$35
 003002' 006026                 SGN$35: ROR     (SP)+
 003004' 103401                         BCS     OUT$35
 003006' 005402                         NEG     R2
 003010' 010216                 OUT$35: MOV     R2,@SP
 003012' 000134                         JMP     @(R4)+
 003014' 006026                 NGM$35: ROR     (SP)+
 003016' 103774                         BCS     OUT$35
 003020' 005746                 OVR$35: TST     -(SP)
```

473


```
 003022' 004567  001212                 JSR     R5,$ERR
 003026' 000401                         BR      $ER$35
 003030'    003                         .BYTE   3
 003031'    026                         .BYTE   22.
 003032' 005002                 $ER$35: CLR     R2
 003034' 000762                         BR      SGN$35
                                        .ENDC
                                        .ENDC
                                        .TITLE  S$GL02
                                        .IFDF   CND$36
                                        .GLOBL  SNGL,$ERR
                                        R0=%0
                                        R1=%1
                                        R4=%4
                                        R5=%5
                                SNGL:   MOV     2(R5),R4
                                        MOV     (R4)+,R0
                                        MOV     (R4)+,R1
                                        MOV     @R4,R4
                                        ROL     R4
                                        ADC     R1
                                        ADC     R0
                                        BCS     OVR$36
                                        BVS     OVR$36
                                        RTS     R5
                                OVR$36: JSR     R5,$ERR
                                        RTS     R5
                                        .BYTE   4
                                        .BYTE   12.
                                        .ENDC
                                        .TITLE  S$IN04
                                        .IFDF   CND$37
                                        .GLOBL  SIN,COS
                                        .IFNDF  FPU
                                        .GLOBL  $ADR,$MLR,$SBR,$OVR,$INTR,$POL$H
                                        .ENDC
            000000                      R0=%0
            000001                      R1=%1
            000002                      R2=%2
            000003                      R3=%3
            000004                      R4=%4
            000005                      R5=%5
            000006                      SP=%6
            000007                      PC=%7
            000000                      F0=%0
            000001                      F1=%1
            000002                      F2=%2
            000003                      F3=%3
                                        .IFNDF  FPU
 003036' 016504  000002         COS:    MOV     2(R5),R4
 003042' 005046                         CLR     -(SP)
 003044' 016446  000002                 MOV     2(R4),-(SP)
 003050' 011446                         MOV     @R4,-(SP)
 003052' 012746  007733                 MOV     #007733,-(SP)
 003056' 012746  040311                 MOV     #040311,-(SP)
```

474

```
 5065  003062' 004467  001810                  JSR     R4,$POLSH
 5066  003066' 000006' 003106'                 .WORD   $ADR,$NCS37
 5067  003072' 016504  000002          SINI    MOV     2(R5),R4
 5068  003076' 005046                          CLR     -(SP)
 5069  003100' 016446  000002                  MOV     2(R4),-(SP)
 5070  003104' 011446                          MOV     @R4,-(SP)
 5071  003106' 006316                  SNCS37: ASL     @SP
 5072  003110' 006066  000004                  ROR     4(SP)
 5073  003114' 006016                          ROR     @SP
 5074  003116' 012746  007733                  MOV     #007733,-(SP)
 5075  003122' 012746  040711                  MOV     #040711,-(SP)
 5076  003126' 004467  000744                  JSR     R4,$POLSH
 5077  003132' 001234'                         .WORD   $OVR
 5078  003134' 003238'                         .WORD   DUPS37
 5079  003136' 001134'                         .WORD   $INTR
 5080  003140' 000002'                         .WORD   $$BR
 5081  003142' 003242'                         .WORD   X4S37
 5082  003144' 003238'                         .WORD   DUPS37
 5083  003146' 001134'                         .WORD   $INTR
 5084  003150' 003254'                         .WORD   QUDS37
 5085  003152' 000002'                         .WORD   $$BR
 5086  003154' 003262'                         .WORD   QS?S37
 5087  003156' 003238'                 QSES37: .WORD   DUPS37
 5088  003160' 003238'                         .WORD   DUPS37
 5089  003162' 002322'                         .WORD   $MLR
 5090  003164' 003332'                         .WORD   PLYS37
 5091  003166' 002322'                         .WORD   $MLR
 5092  003170' 000006'                         .WORD   $ADR
 5093  003172' 002322'                         .WORD   $MLR
 5094  003174' 000006'                         .WORD   $ADR
 5095  003176' 002322'                         .WORD   $MLR
 5096  003200' 000006'                         .WORD   $ADR
 5097  003202' 002322'                         .WORD   $MLR
 5098  003204' 000006'                         .WORD   $ADR
 5099  003206' 002322'                         .WORD   $MLR
 5100
 5101  003210' 003212'                         .WORD   RTNS37
 5102  003212' 012600                  RTNS37: MOV     (SP)+,R0
 5103  003214' 012601                          MOV     (SP)+,R1
 5104  003216' 005726                          TST     (SP)+
 5105  003220' 002002                          BGE     RTIS37
 5106  003222' 062700  100000                  ADD     #100000,R0
 5107  003226' 000205                  RTIS37: RTS     R5
 5108  003230' 016646  000002          DUPS37: MOV     2(SP),-(SP)
 5109  003234' 016646  000002                  MOV     2(SP),-(SP)
 5110  003240' 000134                          JMP     @(R4)+
 5111  003242' 005716                  X4S37:  TST     @SP
 5112  003244' 001762                          BEQ     RTNS37
 5113  003246' 105266  000001                  INCB    1(SP)
 5114  003252' 000134                          JMP     @(R4)+
 5115  003254' 051666  000010          QUDS37: BIS     @SP,8.(SP)
 5116  003260' 000134                          JMP     @(R4)+
 5117  003262' 105766  000004          QS?S37: TSTB    4(SP)
 5118  003266' 001413                          BEQ     Q13S37
 5119  003270' 062716  100000                  ADD     #100000,@SP
```

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```
 5120  003274' 005046                          CLR     -(SP)
 5121  003276' 012746  040200                  MOV     #40200,-(SP)
 5122  003302' 004467  000570                  JSR     R4,$POLSH
 5123  003306' 000006' 003312'                 .WORD   $ADR,QSRS37
 5124  003312' 012704  003136'          QSRS37: MOV     #QSES37,R4
 5125  003316' 106266  000005          Q13S37: ASRB    5(SP)
 5126  003322' 103002                          BCC     QUTS37
 5127  003324' 062716  100000                  ADD     #100000,@SP
 5128  003330' 000134                  QUTS37: JMP     @(R4)+
 5129  003332' 012600                  PLYS37: MOV     (SP)+,R0
 5130  003334' 012601                          MOV     (SP)+,R1
 5131  003336' 012702  003412'                 MOV     #CONS37+4,R2
 5132  003342' 012703  000005                  MOV     #5,R3
 5133  003346' 000402                          BR      PY1S37
 5134  003350' 010146                  PY2S37: MOV     R1,-(SP)
 5135  003352' 010046                          MOV     R0,-(SP)
 5136  003354' 014246                  PY1S37: MOV     -(R2),-(SP)
 5137  003356' 014246                          MOV     -(R2),-(SP)
 5138  003360' 005303                          DEC     R3
 5139  003362' 003372                          BGT     PY2S37
 5140  003364' 000134                          JMP     @(R4)+
 5141                                          .ENDC
 5142                                          .IFDF   FPU
 5143                                  COSI:   SETD
 5144                                          LDCFD   @2(R5),F0
 5145                                          ADDD    P12S37,F0
 5146                                          BR      SNCS37
 5147                                  SINI:   SETD
 5148                                          LDCFD   @2(R5),F0
 5149                                  SNCS37: SETI
 5150                                          MOV     #FCOS37,R0
 5151                                          CLR     R4
 5152                                          CFCC
 5153                                          BGE     POS$37
 5154                                          INC     R4
 5155                                          ABSD    F0
 5156                                  POS$37: DIVD    (R0)+,F0
 5157                                          MODD    #8.25,F0
 5158                                          SETF
 5159                                          LDEDF   F0,F0
 5160                                          CFCC
 5161                                          BEQ     RTNS37
 5162                                          MODF    #4.0,F0
 5163                                          STCFI   F1,R1
 5164                                          ROR     R1
 5165                                          BCC     Q13S37
 5166                                          NEGF    F0
 5167                                          ADDF    #1.0,F0
 5168                                  Q13S37: ROR     R1
 5169                                          BCC     Q12S37
 5170                                          NEGF    F0
 5171                                  Q12S37: LDF     F0,F2
 5172                                          MULF    F2,F2
 5173                                          MOV     #1,R1
 5174                                          LDF     (R0)+,F1
```

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```
                                XPQS37: MULF    F2,F1
                                        DEC     R1
                                        ADDF    (R0)+,F1
                                        BGT     XPQS37
                                        MULF    F1,F0
                                        TST     R4
                                        BEQ     RTNS37
                                        NEGF    F0
                                RTNS37: STF     F0,-(SP)
                                        MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                        RTS     R5
                                FCQS37:
                                PI2337: .WORD   040311,007732
                                        .WORD   121041,064302
                                        .ENDC
000366' 035036  153672                  .WORD   035036,153672
000372' 136231  023143                  .WORD   136231,023143
000376' 037243  032130                  .WORD   037243,032130
000402' 140045  056741                  .WORD   140045,056741
000406' 040311  007733          CONS37: .WORD   040311,007733
                                        .ENDC
                                        .TITLE  $TNH02
                                        .IFDF   CNQS38
                                        .GLOBL  TANH,EXP,$ADR,$SBR,$MLR,$DVR,$FCALL
                                        .GLOBL  $POLSH,$PSHR3
                                R0=%0
                                R1=%1
                                R4=%4
                                R5=%5
                                SP=%6
                                PC=%7
                                TANH:   MOV     R5,-(SP)
                                        MOV     2(R5),R5
                                        MOV     @R0,R0
                                        BEQ     ZERS38
                                        ASL     R0
                                        CLRB    R0
                                        SWAB    R0
                                        CMP     R0,#205
                                        BLT     STES38
                                        MOV     #40200,R0
                                        CLR     R1
                                        TST     @R5
                                        BGE     OUTS38
                                        ADD     #100000,R0
                                        BR      OUTS38
                                STES38: CMP     R0,#177
                                        BGT     TANS38
                                        CMP     R0,#104
                                        BGE     SMLS38
                                        MOV     2(R5),R1
                                        MOV     @R5,R0
                                        BR      OUTS38
                                TANS38: MOV     2(R5),-(SP)
```

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```
                                        MOV     @R5,-(SP)
                                        ADD     #200,@SP
                                        MOV     SP,R5
                                        MOV     #EXP,R4
                                        JSR     PC,$FCALL
                                        MOV     R1,-(SP)
                                        MOV     R0,-(SP)
                                        CLR     -(SP)
                                        MOV     #40200,-(SP)
                                        MOV     R1,-(SP)
                                        MOV     R0,-(SP)
                                        CLR     -(SP)
                                        MOV     #40200,-(SP)
                                        JSR     R4,$POLSH
                                        .WORD   S$BR,UPS38,$ADR,$DVR,UPLS38
                                UPLS38: MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                OUTS38: MOV     (SP)+,R5
                                        RTS     R5
                                SMLS38: MOV     2(R5),R1
                                        MOV     @R5,R0
                                        JSR     R4,$POLSH
                                        .WORD   $PSHR3,$PSHR3,$PSHR3,$MLR,XSQS38
                                XSQS38: MOV     2(SP),-(SP)
                                        MOV     2(SP),-(SP)
                                        JSR     R4,$POLSH
                                        .WORD   P35S38,$ADR,ONES38
                                        .WORD   $PSHR3,P45S38,$PSHR3,$DVR,$ADR,$ADR,$DVR
                                        .WORD   S$BR,$MLR,UPLS38
                                ONES38: MOV     4(SP),R0
                                        MOV     6(SP),R1
                                        CLR     6(SP)
                                        MOV     #40200,4(SP)
                                        JMP     @(R4)+
                                P45S38: MOV     #136237,-(SP)
                                        MOV     #41466,-(SP)
                                P15S38: MOV     #165707,-(SP)
                                        MOV     #41722,-(SP)
                                        JMP     @(R4)+
                                P35S38: MOV     #110407,-(SP)
                                        MOV     #41416,-(SP)
                                        JMP     @(R4)+
                                ZERS38: CLR     R0
                                        CLR     R1
                                        BR      OUTS38
                                UPS38:  MOV     (SP)+,10,(SP)
                                        MOV     (SP)+,10,(SP)
                                        JMP     @(R4)+
                                        .ENDC
                                        .TITLE  $ATN02
                                        .IFDF   CNQS37
                                        .GLOBL  ATAN
                                        .IFNDF  $BAS
```

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```
                                        .GLOBL  ATAN2
                                        .ENDC
                                        .IFNDF  FPU
                                        .GLOBL  $ADR,$SUBR,$MLR,$DVR,$POLSH,$POPR3
                                        .ENDC
                000000                  R0=%0
                000001                  R1=%1
                000002                  R2=%2
                000003                  R3=%3
                000004                  R4=%4
                000005                  R5=%5
                000006                  SP=%6
                000000                  F0=%0
                000001                  F1=%1
                000002                  F2=%2
                000003                  F3=%3
                000004                  F4=%4
                000005                  F5=%5
                                        .IFNDF  FPU
                                        .IFNDF  $DAS
                                ATAN2:  CLR     -(SP)
                                        CLR     -(SP)
                                        CLR     -(SP)
                                        CLR     -(SP)
                                        CLR     -(SP)
                                        MOV     2(R5),R4
                                        MOV     2(R4),-(SP)
                                        MOV     R4,-(SP)
                                        MOV     SP,R0
                                        MOV     4(R5),R4
                                        MOV     2(R4),-(SP)
                                        MOV     R4,-(SP)
                                        MOV     SP,R1
                                        BEQ     INP$39
                                        ASL     R0
                                        CLRB    R0
                                        SWAB    R0
                                        ASL     R1
                                        CLRB    R1
                                        SWAB    R1
                                        SUB     R1,R0
                                        CMP     #26.,R0
                                        BLT     INP$39
                                DIV$39: JSR     R4,$POLSH
                                        .WORD   $DVR,UPL$39
                                UPL$39: TST     @4(R5)
                                        BGE     ATE$39
                                        MOV     #040311,0*(SP)
                                        MOV     #007733,10*(SP)
                                        TST     @2(R5)
                                        BGE     ATE$39
                                        ADD     #100000,8.(SP)
                                ATE$39: TST     @SP
```

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```
                                        BR      AT1$39
                                INP$39: ADD     #10.,SP
                                        MOV     #040311,R0
                                        MOV     #007733,R1
                                        TST     @2(R5)
                                        BGE     INR$39
                                        ADD     #100000,R0
                                INR$39: RTS     R5
                                        .ENDC

003412' 005046                  ATAN1:  CLR     -(SP)
003414' 005046                          CLR     -(SP)
003416' 005046                          CLR     -(SP)
003420' 005046                          CLR     -(SP)
003422' 005046                          CLR     -(SP)
003424' 016504 000002                   MOV     2(R5),R4
003430' 016446 000002                   MOV     2(R4),-(SP)
003434' 011446                          MOV     @R4,-(SP)
003436' 002004                  AT1$39: BGE     PLU$39
003440' 062716 100000                   ADD     #100000,@SP
003444' 005266 000014                   INC     12.(SP)
003450' 021627 040200           PLU$39: CMP     @SP,#40200
003454' 103431                          BLO     LE1$39
003456' 003003                          BGT     GT1$39
003460' 005766 000002                   TST     2(SP)
003464' 001425                          BEQ     LE1$39
003466' 012766 140311 000004    GT1$39: MOV     #140311,4(SP)
003474' 012766 007733 000006            MOV     #007733,6(SP)
003502' 005366 000014                   DEC     12.(SP)
003506' 016646 000002                   MOV     2(SP),-(SP)
003512' 016646 000002                   MOV     2(SP),-(SP)
003516' 012766 040200 000004            MOV     #40200,4(SP)
003524' 005066 000006                   CLR     6(SP)
003530' 004467 000342                   JSR     R4,$POLSH
003534' 001234' 003540'                 .WORD   $DVR,LE1$39
003540' 016646 000002           LE1$39: MOV     2(SP),-(SP)
003544' 016646 000002                   MOV     2(SP),-(SP)
003550' 005066 000004                   CLR     4(SP)
003554' 005066 000006                   CLR     6(SP)
003560' 021627 037611                   CMP     @SP,#037611
003564' 103445                          BLO     L19$39
003566' 101004                          BHI     TN3$39
003570' 026627 000002 030243            CMP     2(SP),#030243
003576' 101440                          BLO$    L19$39
003600' 012766 040006 000004    TN3$39: MOV     #040006,4(SP)
003606' 012766 005222 000006            MOV     #005222,6(SP)
003614' 011600                          MOV     @SP,R0
003616' 016601 000002                   MOV     2(SP),R1
003622' 012746 131727                   MOV     #131727,-(SP)
003626' 012746 140335                   MOV     #140335,-(SP)
003632' 010146                          MOV     R1,-(SP)
003634' 010046                          MOV     R0,-(SP)
003636' 005046                          CLR     -(SP)
003640' 012746 040200                   MOV     #40200,-(SP)
003644' 012746 131727                   MOV     #131727,-(SP)
```

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```
 5395  003650' 012746  040335                  MOV     #040335,-(SP)
 5396  003654' 010146                          MOV     R1,-(SP)
 5397  003656' 010046                          MOV     R0,-(SP)
 5398  003660' 004467  000212                  JSR     R4,$POLSH
 5399  003664' 002322' 000002' 003770'         .WORD   $MLR,$$BR,UP$39,$$BR,$DVR,L15$39
       003672' 000002' 001234' 003700'
 5400  003700' 011600                  L15$39: MOV     @$P,R0
 5401  003702' 016601  000002                  MOV     2(SP),R1
 5402  003706' 010146                          MOV     R1,-(SP)
 5403  003710' 010046                          MOV     R0,-(SP)
 5404  003712' 010146                          MOV     R1,-(SP)
 5405  003714' 010046                          MOV     R0,-(SP)
 5406  003716' 004467  000154                  JSR     R4,$POLSH
 5407  003722' 002322'                         .WORD   $MLR
 5408  003724' 004002'                         .WORD   PLY$39
 5409  003726' 002322' 000006' 002322'         .WORD   $MLR,$ADR,$MLR,$ADR,$MLR,$ADR
       003734' 000006' 002322' 000006'
 5410  003742' 002322' 000006' 002322'         .WORD   $MLR,$ADR,$MLR,$ADR
       003750' 000006'
 5411  003752' 000006'                         .WORD   $ADR
 5412  003754' 004036'                         .WORD   SGN$39
 5413  003756' 000006'                         .WORD   $ADR
 5414  003760' 002706' 003764'                 .WORD   $POPR3,EX1$39
 5415  003764' 005726                  EX1$39: TST     (SP)+
 5416  003766' 000205                          RTS     R5
 5417  003770' 012666  000012          UP$39:  MOV     (SP)+,12.(SP)
 5418  003774' 012666  000012                  MOV     (SP)+,12.(SP)
 5419  004000' 000134                          JMP     @(R4)+
 5420  004002' 012600                  PLY$39: MOV     (SP)+,R0
 5421  004004' 012601                          MOV     (SP)+,R1
 5422  004006' 012702  004070'                 MOV     #CON$39+4,R2
 5423  004012' 012703  000005                  MOV     #5,R3
 5424  004016' 000402                          BR      PY1$39
 5425  004020' 010146                  PY2$39: MOV     R1,-(SP)
 5426  004022' 010046                          MOV     R0,-(SP)
 5427  004024' 014246                  PY1$39: MOV     -(R2),-(SP)
 5428  004026' 014246                          MOV     -(R2),-(SP)
 5429  004030' 005303                          DEC     R3
 5430  004032' 003372                          BGT     PY2$39
 5431  004034' 000134                          JMP     @(R4)+
 5432  004036' 005706  000010          SGN$39: TST     6.(SP)
 5433  004042' 001402                          BEQ     SG1$39
 5434  004044' 062716  100000                  ADD     #100000,@SP
 5435  004050' 000134                  SG1$39: JMP     @(R4)+
 5436                                          .ENDC
 5437                                          .IFDF   FPU
 5438                                  ATAN2:  SETF
 5439                                          MOV     2(R5),R3
 5440                                          MOV     4(R5),R4
 5441                                          MOV     @R3,R0
 5442                                          MOV     @R4,R1
 5443                                          BEQ     INP$39
 5444                                          ABL     R0
 5445                                          CLRB    R0
 5446                                          SWAB    R0
```

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```
 5447                                          ASL     R1
 5448                                          CLRB    R1
 5449                                          SWAB    R1
 5450                                          SUB     R1,R0
 5451                                          CMP     #26.,R0
 5452                                          BLT     INP$39
 5453                                          LDF     P1$39,F3
 5454                                          LDF     @R3,F0
 5455                                          CFCC
 5456                                          BGE     A1P$39
 5457                                          NEGF    F3
 5458                                  A1P$39: LDF     @R4,F1
 5459                                          CFCC
 5460                                          BLT     A2M$39
 5461                                          CLRF    F3
 5462                                  A2M$39: DIVF    F1,F0
 5463                                          BR      AT1$39
 5464                                  INP$39: LDF     P12$39,F1
 5465                                          TST     @R3
 5466                                          BGE     EX1$39
 5467                                          NEGF    F1
 5468                                          BR      EX1$39
 5469                                  ATAN1:  SETF
 5470                                          CLRF    F3
 5471                                          LDF     @2(R5),F0
 5472                                  AT1$39: CLR     R4
 5473                                          CFCC
 5474                                          STF     F3,F5
 5475                                          CLRF    F3
 5476                                          BGE     PLU$39
 5477                                          ABSF    F0
 5478                                          INC     R4
 5479                                  PLU$39: LDF     #1.0,F1
 5480                                          CMPF    F0,F1
 5481                                          CFCC
 5482                                          BLE     LE1$39
 5483                                  GT1$39: DEC     R4
 5484                                          DIVF    F0,F1
 5485                                          LDF     F1,F0
 5486                                          LDF     P12$39,F3
 5487                                  LE1$39: STF     F3,F4
 5488                                          CLRF    F3
 5489                                          CMPF    T15$39,F0
 5490                                          CFCC
 5491                                          BGE     L15$39
 5492                                          LDF     P16$39,F3
 5493                                          LDF     F0,F1
 5494                                          MULF    RT3$39,F0
 5495                                          SUBF    #1.0,F0
 5496                                          ADDF    RT3$39,F1
 5497                                          DIVF    F1,F0
 5498                                  L15$39: LDF     F0,F2
 5499                                          MULF    F0,F0
 5500                                          MOV     #FCOS$39,R0
 5501                                          MOV     #4,R1
```

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```
                                        LDF     (R0)+,F1
                                XPDS39: MULF    F0,F1
                                        DEC     R1
                                        ADDF    (R0)+,F1
                                        BGT     XPDS39
                                        MULF    F2,F1
                                        ADDF    F3,F1
                                        SUBF    F4,F1
                                        TST     R4
                                        BEQ     SQ1S39
                                        NEGF    F1
                                SQ1S39: ADDF    F5,F1
                                EX1S39: STF     F1,-(SP)
                                        MOV     (SP)+,R0
                                        MOV     (SP)+,R1
                                        RTS     R5
                                P1S39:  .WORD   040511,007733
                                P2S39:  .WORD   040311,007733
                                T15S39: .WORD   037611,030243
                                P1ES39: .WORD   040000,003222
                                RTSS39: .WORD   040337,131727
                                        .ENDC
004052' 037305  035302          FCOS39: .WORD   037305,035302
004056' 137421  056514                  .WORD   137421,056514
004062' 037514  143333                  .WORD   037514,143333
004066' 137652  125244                  .WORD   137652,125244
004072' 040200  000000          CONS39: .WORD   040200,000000
                                        .ENDC
                                        .TITLE  $POL07
                                        .GLOBL  $POLSH
        000004                  R4=X4
        000006                  SP=X6

                                        .GLOBL  SV20A
                                SV20A:
004076' 005726                  $POLSH: TST     (SP)+
004100' 000134                          JMP     @(R4)+
                                        .IFDF   EAE
                                        .GLOBL  $EAE
                                $EAE:
                                        .ENDC
                                        .IFDF   EIS!MULDIV
                                        .GLOBL  $EIS
                                $EIS:
                                        .ENDC
                                        .IFDF   FPU
                                        .GLOBL  $FPU
                                $FPU:
                                        .ENDC
                                        .IFDF   FIS
                                        .GLOBL  $FIS
                                $FIS:
                                        .ENDC
                                        .IFDF   RSX
                                        .GLOBL  $RSX
```

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```
                                $RSX:
                                        .ENDC
                                        .TITLE  $$QT03
                                        .IFDF   CND$41

                                        .GLOBL  SQRT,$ERR
                                        .IFNDF  FPU
                                        .GLOBL  $ADR,$DVR,$POLSH
                                        .ENDC
        000000                          R0=X0
        000001                          R1=X1
        000004                          R4=X4
        000005                          R5=X5
        000006                          SP=X6
        000000                          F0=X0
        000001                          F1=X1
        000002                          F2=X2
                                        .IFDF   FPU
                                SQRT:   MOV     @2(R5),R1
                                        .ENDC
                                        .IFNDF  FPU
004102' 010546                  SQRT:   MOV     R5,-(SP)
004104' 016505  000002                  MOV     2(R5),R5
004110' 011501                          MOV     @R5,R1
                                        .ENDC
004112' 100443                          BMI     ERR$41
004114' 001446                          BEQ     ZERS41
                                        .IFNDF  FPU
004116' 012746  000003                  MOV     #3,-(SP)
                                        .ENDC
004122' 006201                          ASR     R1
004124' 062701  020100                  ADD     #20100,R1
004130' 005046                          CLR     -(SP)
004132' 010146                          MOV     R1,-(SP)
                                        .IFNDF  FPU
004134' 005046                          CLR     -(SP)
004136' 011546                          MOV     @R5,-(SP)
004140' 005046                          CLR     -(SP)
004142' 010146                          MOV     R1,-(SP)
004144' 004467  177726          LUP$41: JSR     R4,$POLSH
004150' 001234' 000006' 004156'         .WORD   $DVR,$ADR,UPL$41
004156' 162716  000200          UPL$41: SUB     #200,@SP
004162' 005366  000004                  DEC     4(SP)
004166' 001410                          BEQ     OUT$41
004170' 016546  000002                  MOV     2(R5),-(SP)
004174' 011546                          MOV     @R5,-(SP)
004176' 016646  000006                  MOV     6(SP),-(SP)
004202' 016646  000006                  MOV     6(SP),-(SP)
004206' 000756                          BR      LUP$41
004210' 012600                  OUT$41: MOV     (SP)+,R0
004212' 012601                          MOV     (SP)+,R1
004214' 005726                          TST     (SP)+
004216' 012605                  RTN$41: MOV     (SP)+,R5
004220' 000205                          RTS     R5
004222' 004567  000012          ERR$41: JSR     R5,$ERR
```

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```
5612  004226' 000773                    BR      RTNS41
5613  004230'     004                   .BYTE   4
5614  004231'     013                   .BYTE   11.
5615  004232' 005000            EERS41: CLR     R0
5616  004234' 005001                    CLR     R1
5617  004236' 000767                    BR      RTNS41
5618                                     .ENDC
5619                                     .IFDF   FPU
5620                                     MOV     #3,R0
5621                                     SETF
5622                                     LDF     (SP)+,F0
5623                                     LDF     #2(R5),F2
5624                                LUPS41: LDF     F0,F1
5625                                     LDF     F2,F0
5626                                     DIVF    F1,F0
5627                                     ADDF    F1,F0
5628                                     DEC     R0
5629                                     DIVF    #2.0,F0
5630                                     BGT     LUPS41
5631                                     STF     F0,@(SP)
5632                                     MOV     (SP)+,R0
5633                                     MOV     (SP)+,R1
5634                                     RTS     R5
5635                                ERRS41: JSR     R5,$ERR
5636                                     RTS     R5
5637                                     .BYTE   4
5638                                     .BYTE   11.
5639                                EERS41: CLR     R0
5640                                     CLR     R1
5641                                     RTS     R5
5642                                     .ENDC
5643                                     .ENDC
5644                                     .TITLE  $ERR01
5645                                     .GLOBL  $ERR,$ERRA,$ERVEC
5646          000000                     R0 = %0
5647          000005                     R5 = %5
5648          000006                     SP = %6
5649          000007                     PC = %7
5650  004240' 010046            $ERR:   MOV     R0,-(SP)
5651  004242' 016500 000002             MOV     2(R5),R0
5652  004246' 000401                    BR      ERR$43
5653  004250' 010046            $ERRA:  MOV     R0,-(SP)
5654                            ERR$43: .IFNDF  CLASS5
5655  004252' 120027 000005             CMPB    R0,#5
5656  004256' 001402                    BEQ     IGN$43
5657                                     .ENDC
5658  004260' 004777 000004             JSR     PC,@$ERVEC
5659  004264' 012600            IGN$43: MOV     (SP)+,R0
5660  004266' 000205                    RTS     R5
5661  004270' 004272'           $ERVEC: .WORD   HLT$43
5662  004272' 000000            HLT$43: HALT
5663  004274' 000776                    BR      HLT$43
5664                                     .TITLE  $LOR01
5665                                     .IFDF   CND$44&CND$42
5666                                     R4=%4
```

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```
5667                                     SP=%6
5668                                LOR1:   MOV     (SP)+,2(SP)
5669                                     MOV     (SP)+,2(SP)
5670                                     JMP     @(R4)+
5671                                     .ENDC
5672                                     .TITLE  $LOD01
5673                                     .IFDF   CND$45&CND$42
5674                                     R0=%0
5675                                     R4=%4
5676                                     SP=%6
5677                                LOD1:   MOV     SP,R0
5678                                     ADD     #8.,R0
5679                                     MOV     (SP)+,(R0)+
5680                                     MOV     (SP)+,(R0)+
5681                                     MOV     (SP)+,(R0)+
5682                                     MOV     (SP)+,(R0)+
5683                                     JMP     @(R4)+
5684                                     .ENDC
5685                                     .TITLE  $STR01
5686                                     .IFDF   CND$46&CND$42
5687                                     R0=%0
5688                                     R1=%1
5689                                     R2=%2
5690                                     R3=%3
5691                                     R4=%4
5692                                     R5=%5
5693                                     SP=%6
5694                                     PC=%7
5695                                STR1:   MOV     #FAC$42,R5
5696                                     TST     30(SP)
5697                                     BEQ     STK$46
5698                                     CLR     30(SP)
5699                                     MOV     SP,R0
5700                                     MOV     SP,R1
5701                                     CMP     (R1)+,(R1)+
5702                                     MOV     #13.,R2
5703                                LPS46:  MOV     (R1)+,(R0)+
5704                                     DEC     R2
5705                                     BNE     LPS46
5706                                     MOV     (R5)+,(R0)+
5707                                     MOV     (R5)+,(R0)+
5708                                     JMP     @(R4)+
5709                                STK$46: MOV     (R5)+,(R0)+
5710                                     MOV     (R5)+,(R0)+
5711                                     CMP     (SP)+,(SP)+
5712                                     JMP     @(R4)+
5713                                     .ENDC
5714                                     .TITLE  $STD01
5715                                     .IFDF   CND$47&CND$42
5716                                     R0=%0
5717                                     R1=%1
5718                                     R2=%2
5719                                     R3=%3
5720                                     R4=%4
5721                                     R5=%5
```

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```
                                        SP=%6
                                        PC=%7
                        SSTD1:  MOV     #FAC$42,R5
                                TST     34(SP)
                                BEQ     STK$47
                                CLR     34(SP)
                                MOV     SP,R0
                                MOV     SP,R1
                                ADD     #10,R1
                                MOV     #13,R2
                        LP$47:  MOV     (R1)+,(R0)+
                                DEC     R2
                                BNE     LP$47
                                MOV     (R5)+,(R0)+
                                MOV     (R5)+,(R0)+
                                MOV     (R5)+,(R0)+
                                MOV     (R5)+,(R0)+
                                JMP     @(R4)+
                        STK$47: MOV     (R5)+,(R0)+
                                MOV     (R5)+,(R0)+
                                MOV     (R5)+,(R0)+
                                MOV     (R5)+,(R0)+
                                ADD     #10,SP
                                JMP     @(R4)+
                                .ENDC
                                .TITLE  FPMP11 FLOATING POINT & MATH PACKAGE
000001                          .END
```

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```
A       = 000010        AC      = 177302        AINT    000116RG        AIS$4   001142R
ALOG    000542RG        ASH     = 177316        ASL$4   001210R         ATAN    003412RG
AT1$39  003436R         A1      = 000004        A2      = 000010        A2NS2   000104R
B       = 000014        BT9$2   000462R         B1      = 000006        B2      = 000012
B2NS30  002424R         B2ES30  002440R         B9AS2   000402R         CFRS20  002066R
CND$18  = 000001        CND$2   = 000001        CND$20  = 000001        CND$27  = 000001
CND$3   = 000001        CND$30  = 000001        CND$33  = 000001        CND$35  = 000001
CND$37  = 000001        CND$39  = 000001        CND$4   = 000001        CND$41  = 000001
CON$3   001112R         CON$37  003406R         CON$39  004072R         CQS     003036RG
COV$30  002646R         D       = 000010        DCH$18  001420R         DEC$35  002770R
DMI$18  001472R         DLW$18  001464R         DNE$35  002774R         DNE$4   001220R
DN1$4   001226R         DUP$20  002032R         DUP$3   001006R         DUP$37  003230R
DV1$18  001606R         ECK$2   000210R         ECL$18  001444R         ECL$20  002224R
EGL$30  002606R         EC1$18  001452R         EQ1$18  001636R         EQE$18  001654R
ERB$43  004252R         ERRFPU  000002RG         ERR$3   001002R         ERR$41  004222R
ESV$20  002056R         EXA$2   000142R         EXI$3   001032R         EXI$39  003764R
EXP     001666RG        FCO$39  004052R         FLT$18  001526R         F0      =%000000
F1      =%000001        F2      =%000002        F3      =%000003        F4      =%000004
F5      =%000005        GO$18   001632R         GT1$39  003406R         HLT$43  004272R
IFPMP   000000RG        IGN$43  004264R         INC$20  002024R         LE1$39  003940R
LGT$3   001052R         LOG$3   000944R         LSH     = 177314        LUP$41  004144R
L1$$39  003700R         MLT$30  002620R         MQ      = 177304        MT0$30  002654R
MT1$30  002624R         N       = 000014        NCP$2   000222R         NGM$35  003016R
NGO$18  001642R         NOD$2   000370R         NOD$27  002274R         NOM$27  002266R
NOM$30  002476R         NOR     = 177312        NOD$18  001690R         NT0$18  001910R
ONE$20  002202R         OUT$2   000424R         OUT$30  002544R         OUT$35  003010R
OUT$41  004210R         OVR$18  001432R         OVR$2   000434R         OVR$20  002212R
OVR$30  002570R         OVR$35  003020R         OV1$18  001430R         OV1$30  002972R
PC      =%000007        PLE$20  002044R         PLU$39  003450R         PLY$37  003332R
PLY$39  004002R         PL2$3   001028R         POS$20  001706R         POS$27  002252R
PY1$37  003354R         PY1$39  004024R         PY2$37  003350R         PY2$39  004020R
Q       = 000014        QSE$37  003156R         QSR$37  003312R         QST$37  003262R
QUD$37  003254R         QUT$37  003330R         Q13$37  003316R         RE0$3   000734R
RESLT   = 000010        RORS4   001176R         RTN$18  001576R         RTN$37  003212R
RTN$41  004216R         RTS$18  001664R         RT1$37  003226R         R0      =%000000
R1      =%000001        R2      =%000002        R3      =%000003        R4      =%000004
R5      =%000005        SCK$2   000174R         SCL$20  002100R         SCL$3   000772R
SFD$2   000334R         SFL$2   000304R         SFR$2   000234R         SFT$2   000214R
SFT$35  002764R         SF0$2   000324R         SGN$18  001550R         SGN$35  003002R
SGN$39  004036R         SG1$39  004050R         SHF$4   001174R         SIGN    = 000002
SIGNS   = 000000        SIN     003072RG        SMT$20  001714R         SNC$37  003106R
SP      =%000006        SQRT    004102RG        SR      = 177311        SRL$2   000272R
STC$3   000752R         STK$3   000746R         STR$2   000414R         SUB$2   000440R
TNS$39  003600R         UNO$18  001440R         UNO$2   000534R         UNO$30  002600R
UNF$2   000524R         UPL$41  004156R         UPS$3   000700R         UPS$9   003770R
UTS$2   000520R         X0$30   002634R         X00$30  002602R         X4$37   003242R
ZER$18  001414R         ZER$2   000536R         ZER$41  004232R         ZER$27  002320R
ZER$30  002612R         ZER$35  003032R         ZER$41  004232R         ZE1$30  002564R
ZFR$20  002156R         ZTS$2   000500R         $ADR    000000RG        $BAS    = 000001
$DVR    001234RG        $ERR    004240RG        $ERRA   004230RG        $ERVEC  004270RG
$INTR   001134RG        $IR     002236RG        $MLR    002322RG        $POL$H  004076RG
$POPR3  002706RG        $POPR4  002674RG        $POPR5  002674RG        $R1     002714RG
$S0R    000002RG        $V20A   004076RG        .       = 004270R
```

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ERRORS DETECTED: 0

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RUN-TIME: 46 SECONDS
CORE USED: 3K

490

A 4610# 4625 4635 4637
A1 797# 820 821 829 831 836 843 845 858 988
A2 799# 825 826 831 835 839 845 928
A2N$2 827 834#
AC 801#
AI1$4 1174 1178#
AINT 1137 1170#
ALOG 987 1013#
ASM 804# 3218#
ASL$4 1196# 1199
AT1$39 5358#
ATAN 5282 5350#
B 4611# 4639 4641 4643 4646 4651
B1 798# 819 830 832 844 846 859 981
B2 800# 824 832 840 846 921
B2N$30 4648#
B2E$30 4647 4651#
B9A$2 952# 957
BT9$2 931 937# 969
CFR$20 3689 3711#
CLASS5 5654
CNO$1 454
CNO$10 117 126 1976
CNO$11 2163
CNO$12 2278
CNO$13 117 2313
CNO$14 133 2498
CNO$15 117 2618
CNO$16 2943
CNO$17 3130
CNO$18 15# 111# 139# 3285
CNO$19 117 129 3415
CNO$2 13# 110# 138# 786
CNO$20 16# 109 129 3643
CNO$21 3797
CNO$22 146 3813
CNO$23 142 3828
CNO$24 3843
CNO$25 3926
CNO$26 146 4005
CNO$27 17# 127# 138# 4021
CNO$28 4101
CNO$29 4510
CNO$3 14# 109 126 986
CNO$30 18# 112# 4596
CNO$31 4847
CNO$32 4866
CNO$33 150# 4886
CNO$34 4907
CNO$35 131# 4928
CNO$36 5019
CNO$37 39# 109 113 5041
CNO$38 100 5198

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CNO$39 40# 109 149 5280
CNO$4 114# 1136
CNO$41 41# 137 5500
CNO$42 153 5665 5673 5686 5715
CNO$44 5665
CNO$45 5673
CNO$46 5686
CNO$47 5715
CNO$5 1225
CNO$6 1269
CNO$7 1309
CNO$8 1325
CNO$9 1634
CON$3 1044 1129#
CON$37 5131 5195#
CON$39 5422 5528#
COS 5842 5859#
COV$30 4822 4829#
D 3221# 3241 3254 3256 3259 3263 3264
DCW$18 3242 3290#
DEC$35 4986#
DH1$18 3274 3279 3306#
DLW$18 3276 3278 3302#
DN1$4 1217 1219#
DNE$35 4976 4999#
DNE$4 1183 1188 1210#
DOUBLE 81 94
DVP$20 3698 3703#
DVP$3 1034 1058#
DVP$37 5078 5082 5087 5088 5108#
DV1$18 3307 3315 3387# 3402
EAE 861 871 938 959 963 1190 1201 3266 3275 3285 3385 3317 3323 3386
4065 4068 4073 4079 4624 4657 4803 4817 4983 4989 5539
EC1$18 3289 3299#
ECK$2 850 854#
ECL$18 3292 3295 3297#
ECL$20 3777 3779#
ECL$30 4810 4813#
EIS 5543
EQ1$18 3405 3407#
EQ2$18 3406# 3408
ERB$43 5652 5654#
ERRFPU 20 31#
ERR$3 1020 1073#
ERR$41 5582 5611#
ESV$20 3684 3709#
EXA$2 838 842#
EXI$3 1039 1041 1064#
EXI$39 5414 5415#
EXP 3645 3661#
F0 805# 1002# 1148# 3219# 3657# 4836# 4889# 4944# 5054# 5298# 5571#
F1 1003# 1149# 3220# 3658# 5055# 5299# 5572#
F2 1004# 3659# 5056# 5300# 5573#

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507

```
F3        1885#   3668#   5857#   9381#
F4        5382#
F5        9383#
FCOS39    5524#
FIS       5551
FLTS18    3293    3313    3368#
FPU         24      32     188     887     814     991    1880    1879    1138    1198    1169    3224    3232    3646
          3672    3733    3759    3764    3783    4037    4038    4614    4621    4945    4998    5043    5058    5142
          5288    5304    5437    5547    5563    5574    5577    5584    5591    5619
GOS18     3398    3393    3397#
GTIS39    5363    5366#
HLTS43    5661    5662#   5663
IFPMP       20      23#
IGNS43    5656    5659#
INCS28    3696    3701#
LIMS39    5388    5383    5399    5488#
LEIS39    5362    5365    5374    5375#
LOTS3     1865    1869#
LOOS3     1814#
LSH       1147#   3217#   4008#   4943#
LUPS41    5596#   5685
MIN         38
MLTS38    4658    4653    4818#   4827
MQ         802#   1146#   3215#   4034#   4686#   4942#
MTBS38    4649    4832#   4838
MTIS38    4654    4828#
MULDIV     868     871    1178    1211    3266    3275    3285    3305    3317    3347    3386    4624    4721    4883
          4817    4983    4996    5543
N         3222#   3238    3243    3245    3249    3258
NCPS2      876     878#
NGMS35    5888    5887#
NGOS18    3392    3395    3401#
NODS2      868     986     918#    972
NODS27    4075    4889#
NOMS27    4872#   4877
NOMS38    4776    4788#
NOR        883#   3216#   4835#
NQDS18    3396    3404#
NTBS18    3311    3314#
ONES28    3671    3773#
OUTS2      822     833     922#    927
OUTS38    4797#   4816
OUTS35    5883    5885#   5888
OUTS41    5688    5686#
OV1S18    3293#   3388    3381
OV1S38    4795    4796    4889#
OVRS18    3294#   3372
OVRS2      911     918     919     926#
OVRS28    3668    3771    3776#
OVRS38    4783    4888#
OVRS35    4978    5881    5889#
PC          28     795#   1881#   1145#   1173    3214#   3387    3315    3483    3418    3656#   4885#   4649    4658
          4653    4654    4828    4839    4894#   5853#   5649#   5658
```

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```
PL2S3     1838    1861#
PLES28    3681    3686    3786#
PLUS39    5358    5361#
PLYS37    5898    5129#
PLYS39    5488    5428#
POSS28    3663    3667#
POSS27    4861    4864#
PY1S37    5133    5136#
PY1S39    5424    5427#
PY2S37    5134#   5139
PY2S39    5425#   5438
Q         3223#   3288    3299    3388    3388    3373    3375    3378    3379
Q13S37    5118    5125#
QSES37    5887#   5124
QSRS37    5123    5124#
QSTS37    5886    5117#
QUDS37    5884    5115#
QUTS37    5126    5128#
R0         788#    839     843     852     853     858     875     888     881     888     892     893     895     988
           982     985     987     912     938     933     935     952     956     966     994#   1842   1847   1869
          1138#   1171    1178    1178    1186    1191    1197    1228    3287#   3235    3245    3246    3248    3249
          3273    3291    3294    3296    3382    3389    3391    3398    3399    3649#   3662    3664    3667    3669
          3678    3712    3715    3717    3722    3728    3738    3762    3778    3774    3776    3778    3788    4828#
          4598#   4644    4775    4778    4785    4787    4788    4789    4791    4794    4797    4889    4811    4814
          4821    4823    4824    4829    4834    4835    4887#   4897    4982    4935#   5846#   5182    5186    5129
          5135    5291#   5386    5391    5397    5488    5483    5485    5428    5426    5566#   5886    5815    5846#
          5658    5651    5653    5655    5659
R1         789#    848     844     851     859     888     887     892     896     981     988     915     916     921
           934     955     958     965     966     967     977     995#   1843   1846   1878   1139#   1172   1177
          1187    1192    1196    1219    3288#   3236    3258    3251    3277    3383    3388    3394    3397    3658#
          3718    3721    3727    3729    3763    3773    3781    4829#   4868    4863    4874    4889    4898    4891
          4892    4894    4896    4599#   4645    4774    4777    4784    4785    4786    4792    4793    4798    4815
          4828    4825    4836    4888#   4898    4983    4936#   4967    4969    4971    4972    4973    4974    4977
          4986    5847#   5183    5138    5134    5292#   5387    5398    5396    5481    5482    5484    5421    5425
          5567#   5588    5587    5588    5598    5595    5687    5616
R2         798#    817     826     837     842     848     854     856     872     878     882     884     886     898
           897     996#   1844    1848    1849    1148#   1173    1175    1216    3289#   3252    3256    3257    3258
          3259    3268    3262    3263    3273    3391    3399    3651#   4838#   4866    4876    4891    4688#   4625
          4626    4629    4638    4633    4634    4635    4823    4829    4834    4889#   4899    4937#   4965    4966
          4985    4999    5884    5885    5814    5848#   5131    5136    5137    5293#   5422    5427    5428
R3         791#    818     821     837     842     989     918     912     914     917     928     954     968     971
           978     997#   1141#   1178    1179    1188    1181    1182    1184    1189    1193    1195    1198    3218#
          3253    3264    3265    3277    3394    3397    3652#   4831#   4881#   4636    4637    4638    4828    4898#
          4988    4938#   4971    4979    4988    4981    4984    5849#   5132    5138    5294#   5423    5429
R4         792#    815     874     877     881     889     893     923     925     998#   1814    1818    1819    1831
          1858    1893    1857    1868    1863    1868    1142#   1178    1171    1172    1221    3211#   3233    3386
          3318    3314    3368    3369    3371    3373    3383    3385    3481    3487    3489    3653#   3661    3662
          3676    3677    3678    3679    3688    3782    3789    3788    3718    3731    3765    3767    3768    3769
          3778    4832#   4897    4882#   4622    4646    4651    4655    4779    4788    4782    4788    4888    4882
          4818    4832    4891#   4981    4984    4939#   5888    5858#   5859    5861    5862    5865    5867    5869
          5878    5876    5118    5114    5116    5122    5124    5128    5148    5295#   5355    5356    5357    5373
          5398    5486    5419    5431    5435    5532#   5538    5568#   5596
R5         793#    926     973     999#   1814    1872    1874    1875    1143#   1178    1218    3212#   3234    3282
```

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	3298	3308	3312	3376	3377	3379	3382	3387	3400	3404	3406	3654#	3661	3772
	3775	3779	3782	4603#	4623	4648	4652	4799	4813	4826	4837	4892#	4940#	5010
	5051#	5059	5067	5187	5296#	5355	5410	5569#	5578	5579	5588	5593	5601	5602
	5609	5610	5611	5647#	5651	5668								
REGS3	1035	1042#												
RESLT	4612#	4797	4798											
RORS4	1191#	1194												
RSX	5555													
RTIS37	5105	5107#												
RTNS18	3301	3382#												
RTNS37	5101	5102#	5112											
RTNS41	5609#	5612	5617											
RTSS18	3410#													
SCKS2	841	849#												
SCLS20	3700	3762#												
SGLS3	1038	1054#												
SFOS2	873	885	895#	898										
SFQS2	855	883	894	900#										
SFLS2	887#	891												
SFRS2	857	872#												
SFTS2	856#													
SFTS35	4982#	4987												
SGIS39	5433	5435#												
SGNS18	3374#													
SGNS35	5002#	5015												
SGNS39	5412	5432#												
SHFS4	1185	1189#												
SIGN	4613#	4648												
SIGNS	796#	834	849	983										
SIN	5042	5067#												
SINGLE	66	94												
SMTS20	3666	3669#												
SNCS37	5066	5071#												
SP	794#	806	815	816	819	828	821	823	824	825	826	828	829	838
	831	832	834	835	836	839	840	843	844	845	846	847	849	858
	859	900	901	903	913	928	921	922	923	924	936	1000#	1013	1015
	1016	1017	1018	1019	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030
	1042	1043	1046	1047	1048	1049	1051	1052	1056	1055	1056	1058	1059	1061
	1062	1064	1066	1067	1069	1070	1071	1073	1144#	1176	1177	1189	1195	1219
	1220	3213#	3233	3234	3237	3238	3239	3240	3241	3243	3245	3249	3250	3254
	3255	3256	3257	3259	3263	3264	3280	3281	3288	3290	3293	3297	3299	3300
	3304	3308	3368	3373	3374	3375	3378	3379	3382	3383	3384	3655#	3673	3674
	3675	3676	3677	3678	3679	3701	3703	3704	3706	3707	3709	3711	3713	3716
	3717	3718	3719	3720	3721	3722	3723	3724	3725	3726	3727	3728	3729	3730
	3760	3762	3763	3765	4033#	4059	4060	4064	4071	4089	4093	4095	4096	4604#
	4622	4623	4625	4627	4628	4638	4635	4637	4639	4640	4641	4643	4646	4651
	4655	4790	4797	4798	4799	4800	4801	4806	4808	4812	4893#	4897	4898	4899
	4900	4902	4903	4941#	4967	4968	4970	4981	5002	5005	5007	5009	5052#	5060
	5061	5062	5063	5064	5068	5069	5070	5071	5072	5073	5074	5075	5102	5103
	5104	5108	5109	5111	5113	5115	5117	5119	5120	5121	5125	5127	5129	5130
	5134	5135	5136	5137	5297#	5350	5351	5352	5353	5354	5356	5357	5359	5360
	5361	5364	5366	5367	5368	5369	5370	5371	5372	5375	5376	5377	5378	5379
	5382	5384	5385	5386	5387	5388	5389	5390	5391	5392	5393	5394	5395	5396

LGC

	5397	5400	5401	5402	5403	5404	5405	5415	5417	5418	5420	5421	5425	5426
	5427	5428	5432	5434	5533#	5537	5578#	5578	5585	5589	5590	5592	5593	5594
	5595	5598	5599	5601	5602	5603	5604	5606	5607	5608	5609	5648#	5650	5653
	5659													
SQRT	5562	5578#												
SR	4607#													
SRLS2	879	884#												
STCS3	1045	1048#												
STKS3	1035	1046#												
STRS2	920#	979												
SUBS2	904	930#												
TNSS39	5381	5384#												
UNDS18	3296#	3370												
UNDS2	974	977#												
UNDS30	4781	4811#												
UNFS2	973#													
UPLS41	5597	5598#												
UPS3	1032	1051#												
UPS39	5399	5417#												
UTSS2	953	971#												
X00S30	4833	4835#												
X0S30	4819	4824#	4831											
X4S37	5081	5111#												
ZE1S30	4631	4642	4806#											
ZERS18	3244	3288#												
ZERS2	964	978#												
ZERS20	3665	3778#												
ZERS27	4862	4897#												
ZERS30	4807	4814#												
ZERS35	4975	5011	5014#											
ZERS41	5583	5615#												
ZFRS20	3714	3760#												
ZTSS2	932	958#												
SADR	787	815#	992	1032	1036	1039	3647	3691	3693	3694	3697	5044	5066	5092
	5094	5096	5098	5123	5289	5409	5410	5411	5413	5564	5597			
SBAS	12#	988	1008	4024	4052	4931	4960	5284	5306					
SDVR	992	1032	3206	3233#	3647	3687	3692	3695	5044	5077	5289	5374	5399	5564
	5597													
SERR	787	926	973	987	1074	4929	5010	5562	5611	5645	5650#			
SERRA	3206	3298	3645	3779	4597	4813	5642	5653#						
SERVEC	5645	5658	5661#											
SINTR	1137	1175#	5044	5079	5083									
SIR	992	1038	3647	3685	4822	4859#								
SMLR	992	1035	1036	1038	1041	3647	3682	3690	3699	4597	4622#	5044	5089	5091
	5093	5095	5097	5099	5289	5399	5407	5409	5410					
SPOLSH	992	1031	3647	3680	5044	5065	5076	5122	5289	5373	5398	5406	5531	5537#
	5564	5596												
SPOPR3	4895	4902#	5289	5414										
SPOPR4	4895	4897#												
SPOPR5	4895	4896#												
SRI	3647	3683	4929	4965#										
SSBR	787	806#	992	1032	3647	3688	5044	5088	5085	5289	5399			
SV20A	5535	5536#												

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FOC

```
                        ;
                        ; BASIC/PTS  PART3=BASICH
                        ;
                        ; DEC=11-LPTSA-A-LA3
                        ;
                        ; COPYRIGHT 1973
                        ;
                        ; DIGITAL EQUIPMENT CORPORATION
                        ; MAYNARD, MASSACHUSETTS 01754
```



```
                            .TITLE  BASICH V00$A EDIT #028 (REF) 01/31/73
                                                BASIC SOURCE FILE #15
                        ;
                        ;
                        ;
                        ;
                        ; USER AREA AND ONCE-ONLY INIT. CODE,
                        ;
                        ; TO BE LINKED LAST AFTER BASICL AND FPMP-11 TO FORM BASIC.
```

```
                                ;
                                ; GLOBALS
                                ;
                                        .GLOBL  TPB, TKB
                                        .GLOBL  START, FILLCO
                                        .GLOBL  USRAREA
                                        .GLOBL  LIMIT, POL, ARRAYS, PDSIZE
                                        .GLOBL  TABLES, TBLEND
                                        .GLOBL  COLUMN; FAC1, FAC2, .RPAR
                                        .GLOBL  ERRMIX, ERRPDL, ERRSYN, ERRARG
                                        .GLOBL  EVAL, INT, MAKEST, OPRATO, SOPRAT
                                        .GLOBL  .COMMA, T1, T2, T3
                                        .GLOBL  ARGB, SAVCHAR, NUMSGN, STPRO
                                        .GLOBL  NORM, VAL
                                        .GLOBL  RND1, RND2
                                        .GLOBL  SSTKSZ ,IFPMP
                                ;
                                ; ASSEMBLY PARAMETERS
                                ;
                                        .IFNDF  STPBSZ  ;TELEPRINTER BUFFER SIZE
                                STPBSZ  #20             ;CHARACTERS
                                        .ENDC
                                ;
                                        .IFNDF  SKBBSZ  ;KEYBOARD BUFF; SIZE
                                SKBBSZ  #20             ;CHARACTERS
                                        .ENDC
                                ;
                                        .IFNDF  SULNSP  ;USER LINE SPACE
                                SULNSP  #128            ;BYTES
                                        .ENDC
```



```
                000000'                 .CSECT
                000000                  R0      =%0
                000001                  R1      =%1
                000002                  R2      =%2
                000003                  R3      =%3
                000004                  R4      =%4
                000005                  R5      =%5
                000006                  SP      =%6
                000007                  PC      =%7
                000040                  BL      =40
                
000000' 000000                  USRAREA:.WORD   0
                                BASICH:
                                ;RND FUNCTION -- GENERATE RANDOM NUMBER
                                ;       SCAN PAST ARG IF PRESENT
000002' 004737  000000G         RNDLFN: JSR     PC,@#EVAL
000006' 103452                          BCS     ERRNDA
000010' 122127  000000G                 CMPB    (R1)+,#,RPAR
000014' 001045                          BNE     ERRNDS
                                RNDFN:
000016' 010500                  RNDFN2: MOV     R5,R0
000020' 062700  000000G                 ADD     #RND2,R0
000024' 011003                          MOV     @R0,R3
000026' 014002                          MOV     -(R0),R2
000030' 006303                          ASL     R3              ;MULT BY 2
000032' 006102                          ROL     R2
000034' 062002                          ADD     (R0)+,R2        ;NOW BY 3
000036' 061003                          ADD     @R0,R3
000040' 005502                          ADC     R2
000042' 061002                          ADD     @R0,R2          ;NOW BY 2**16**3
000044' 100002                          BPL     RPLUS
000046' 062702  100000                  ADD     #100000,R2      ;GET 2**32+G
000052' 010310                  RPLUS:  MOV     R3,@R0          ;STORE NEW GENERATORS
000054' 010240                          MOV     R2,-(R0)
000056' 012700  000201                  MOV     #201,R0         ;INITIAL EXPONENT
000062' 006303                  RNORM:  ASL     R3              ;FLOAT RESULT
000064' 006102                          ROL     R2
000066' 103402                          BCS     REXP            ;JUMP WHEN LEADING BIT FOUND
000070' 005300                          DEC     R0              ;ADJUST EXPONENT FOR SHIFT
000072' 000773                          BR      RNORM
000074' 105003                  REXP:   CLRB    R3
000076' 150203                          BISB    R2,R3
000100' 000303                          SWAB    R3
000102' 105002                          CLRB    R2
000104' 150002                          BISB    R0,R2           ;INSERT EXPONENT INTO RESULT
000106' 000302                          SWAB    R2
000110' 006002                          ROR     R2
000112' 006003                          ROR     R3              ;INSERT + SIGN
000114' 010265  000000G                 MOV     R2,FAC1(R5)
000120' 010365  000000G                 MOV     R3,FAC2(R5)
000124' 000137  000000G                 JMP     @#OPRATOR
000130' 000137  000000G         ERRNDS: JMP     @#ERRSYN
000134' 000137  000000G         ERRNDA: JMP     @#ERRARG
                                RNDFNE:
```

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```
                                        ;ABS FUNCTION ROUTINE
000140' 004737 000000G          ABSFN1: JSR     PC,@#EVAL
000144' 103438                          BCS     ERABSA
000146' 122127 000000G                  CMPB    (R1)+,#,RPAR
000152' 001027                          BNE     ERABS$
000154' 005765 000000G                  TST     FAC1(R5)
000160' 001405                          BEQ     ABSINT
000162' 100017                          BPL     ABSX
000164' 042765 100000 000000G           BIC     #100000,FAC1(R5)
000172' 000413                          BR      ABSX
000174' 005765 000000G          ABSINT: TST     FAC2(R5)
000200' 100010                          BPL     ABSX
000202' 005465 000000G                  NEG     FAC2(R5)
000206' 102005                          BVC     ABSX
000210' 012765 044000 000000G           MOV     #44000,FAC1(R5)
000216' 005065 000000G                  CLR     FAC2(R5)
000222' 000137 000000G          ABSX:   JMP     @#OPRATOR
000226' 000137 000000G          ERABSA: JMP     @#ERRARG
000232' 000137 000000G          ERABS$: JMP     @#ERR$YN
                                ABSFNE:
```



```
                                        ;SGN FUNCTION ROUTINE
000236' 004737 000000G          SGNFN1: JSR     PC,@#EVAL
000242' 103424                          BCS     ERSGNA
000244' 122127 000000G                  CMPB    (R1)+,#,RPAR
000250' 001023                          BNE     ERSGN$
000252' 005008                          CLR     R0
000254' 005765 000000G                  TST     FAC1(R5)
000260' 001003                          BNE     SGNFLT
000262' 005765 000000G                  TST     FAC2(R5)
000266' 001410                          BEQ     SGNX
000270' 100002                  SGNFLT: BPL     SGNPOS
000272' 005300                          DEC     R0
000274' 000401                          BR      .+4
000276' 005200                  SGNPOS: INC     R0
000300' 010065 000000G                  MOV     R0,FAC2(R5)
000304' 005065 000000G                  CLR     FAC1(R5)
000310' 000137 000000G          SGNX:   JMP     @#OPRATOR
000314' 000137 000000G          ERSGNA: JMP     @#ERRARG
000320' 000137 000000G          ERSGN$: JMP     @#ERR$YN
                                SGNFNE:
```

```
                                        ;TAB FUNCTION ROUTINE
000324' 004737 0000000G         TABFN:  JSR     PC,@#ARGB
000330' 122127 0000000          CMPB    (R1)+,#,RPAR
000334' 001036                  BNE     ERTAB$
000336' 005046                  CLR     -(SP)
000340' 116516 0000000G         MOVB    FAC2(R5),(SP)
000344' 021627 000110           TABB:   CMP     (SP),#72.
000350' 103403                  BLO     TABC
000352' 162716 000110           SUB     #72.,(SP)
000356' 000772                  BR      TABB
000360' 167516 0000000G         TABC:   SUB     @COLUMN(R5),(SP)
000364' 100001                  BPL     .+4
000366' 005016                  CLR     (SP)
000370' 001002                  BNE     TABNON
000372' 005316                  DEC     (SP)
000374' 000414                  BR      TABNULL
000376' 010502                  TABNON: MOV     R5,R2
000400' 004737 0000000G                 JSR     PC,@#MAKESTR
000404' 011600                  MOV     (SP),R0
000406' 005002                  CLR     R2
000410' 151002                  BISB    (R0),R2
000412' 062700 000003           ADD     #3,R0
000416' 112720 000040           MOVB    #BL,(R0)+
000422' 005302                  DEC     R2
000424' 003374                  BGT     .+6
000426' 000137 0000000G         TABNULL:JMP     @#$OPRATR
000432' 000137 0000000G         ERTAB$: JMP     @#ERR$YN
                                TABFNE:
```



```
                                        ; LEN FUNCTION ROUTINE
000436' 004737 0000000G         LENFN:  JSR     PC,@#EVAL
000442' 103016                  BCC     ERLENA
000444' 122127 0000000          CMPB    (R1)+,#,RPAR
000450' 001015                  BNE     ERLEN$
000452' 005065 0000000G         CLR     FAC1(R5)
000456' 005065 0000000G         CLR     FAC2(R5)
000462' 012602                  MOV     (SP)+,R2
000464' 005202                  INC     R2
000466' 001402                  BEQ     .+6
000470' 114265 0000000G         MOVB    -(R2),FAC2(R5)
000474' 000137 0000000G         JMP     @#$OPRATOR
000500' 000137 0000000G         ERLENA: JMP     @#ERRARG
000504' 000137 0000000G         ERLEN$: JMP     @#ERR$YN
                                LENFNE:
```

```
                                        ; ASC FUNCTION ROUTINE
000510' 004737 000000G          ASCFN:  JSR     PC,@#EVAL
000514' 103023                          BCC     ERASCA
000516' 122127 000000G                  CMPB    (R1)+,#,RPAR
000522' 001022                          BNE     ERASCS
000524' 012602                          MOV     (SP)+,R2
000526' 020227 177777                   CMP     R2,#177777
000532' 001414                          BEQ     ERASCA
000534' 121227 000001                   CMPB    (R2),#1
000540' 001011                          BNE     ERASCA
000542' 005065 000000G                  CLR     FAC1(R5)
000546' 005065 000000G                  CLR     FAC2(R5)
000552' 116265 000003  000000G          MOVB    3(R2),FAC2(R5)
000560' 000137 000000G                  JMP     @#OPRATOR
000564' 000137 000000G          ERASCA: JMP     @#ERRARG
000570' 000137 000000G          ERASCS: JMP     @#ERR$YN
                                ASCFNE:
                                        ; CHR$ FUNCTION ROUTINE
000574' 004737 000000G          CHRSFN: JSR     PC,@#ARGB
000600' 122127 000000G                  CMPB    (R1)+,#,RPAR
000604' 001016                          BNE     ERCHR$
000606' 142765 000200  000000G          BICB    #200,FAC2(R5)   ;TAKE CHAR MOD 128
000614' 012746 000001                   MOV     #1,-(SP)
000620' 010502                          MOV     R5,R2
000622' 004737 000000G                  JSR     PC,@#MAKE$TR
000626' 011600                          MOV     (SP),R0
000630' 116500 000000G 000003           MOVB    FAC2(R5),3(R0)
000636' 000137 000000G                  JMP     @#SOPRATR
000642' 000137 000000G          ERCHRS: JMP     @#ERR$YN
                                CHRFNE:
```



```
                                        ; POS FUNCTION ROUTINE
000646' 004737 000000G          POSFN:  JSR     PC,@#EVAL
000652' 103133                          BCC     ERPOSA
000654' 122127 000000G                  CMPB    (R1)+,#,COMMA
000660' 001132                          BNE     ERPOS$
000662' 004737 000000G                  JSR     PC,@#EVAL
000666' 103125                          BCC     ERPOSA
000670' 122127 000000G                  CMPB    (R1)+,#,COMMA
000674' 001124                          BNE     ERPOS$
000676' 004737 000000G                  JSR     PC,@#EVAL
000702' 103517                          BCS     ERPOSA
000704' 004737 000000G                  JSR     PC,@#INT
000710' 122127 000000G                  CMPB    (R1)+,#,RPAR
000714' 001114                          BNE     ERPOS$
000716' 005000                          CLR     R0
000720' 005765 000000G                  TST     FAC1(R5)
000724' 001077                          BNE     POSF
000726' 005765 000000G                  TST     FAC2(R5)
000732' 003474                          BLE     POSF
000734' 156500 000000G                  BISB    FAC2(R5),R0     ;R0 IS N
                                ;CHECK NULL XS
000740' 026627 000002  177777           CMP     2(SP),#177777
000746' 001002                          BNE     POSX
000750' 005000                          CLR     R0
000752' 000464                          BR      POSF
                                ;COMPUTE LENGTH OF XS
000754' 005002                  POSX:   CLR     R2
000756' 157602 000002                   BISB    @2(SP),R2
                                ;CHECK NULL YS
000762' 021627 177777                   CMP     (SP),#177777
000766' 001004                          BNE     POSY
                                ;NULL YS, ANS IS MIN(N,LEN(XS))
000770' 020002                          CMP     R0,R2
000772' 003454                          BLE     POSF
000774' 010200                          MOV     R2,R0
000776' 000452                          BR      POSF
                                ;SAVE ADDR OF END OF YS IN T2
001000' 005003                  POSY:   CLR     R3
001002' 157603 000000                   BISB    @(SP),R3
001006' 061603                          ADD     (SP),R3
001010' 062703 000003                   ADD     #3,R3
001014' 010365 000000G                  MOV     R3,T2(R5)
001020' 012603                          MOV     (SP)+,R3
001022' 062703 000003                   ADD     #3,R3
                                ;SAVE ADDR OF END OF XS IN T1
001026' 061602                          ADD     (SP),R2
001030' 062702 000003                   ADD     #3,R2
001034' 010265 000000G                  MOV     R2,T1(R5)
001040' 012602                          MOV     (SP)+,R2
001042' 060002                          ADD     R0,R2
001044' 062702 000002                   ADD     #2,R2
                                ;FIND MATCHING FIRST CHARACTER
001050' 121322                  POSFST: CMPB    (R3),(R2)+
001052' 001406                          BEQ     POSREM
001054' 005200                  POSTRY: INC     R0
```

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```
  298 001056' 020265 0000000G            CMP     R2,T1(R5)
  299 001062' 001372                     BNE     POSFST
  300 001064' 005000                     CLR     R0
  301 001066' 000417                     BR      POSF2
  302                                ;CHECK THAT REMAINING CHARS MATCH
  303 001070' 010246                 POSREM: MOV     R2,-(SP)
  304 001072' 010346                     MOV     R3,-(SP)
  305 001074' 005203                     INC     R3
  306 001076' 020365 0000000G        POSNXT: CMP     R3,T2(R5)
  307 001102' 001410                     BEQ     POSF
  308 001104' 020265 0000000G            CMP     R2,T1(R5)
  309 001110' 001402                     BEQ     POSNO
  310 001112' 122223                     CMPB    (R2)+,(R3)+
  311 001114' 001770                     BEQ     POSNXT
  312 001116' 012603                 POSNO: MOV     (SP)+,R3
  313 001120' 012602                     MOV     (SP)+,R2
  314 001122' 000754                     BR      POSTRT
  315                                ;RETURN FROM FUNCTION
  316 001124' 022626                 POSF:  CMP     (SP)+,(SP)+
  317 001126' 010065 0000000G        POSF2: MOV     R0,FAC2(R5)
  318 001132' 005065 0000000G            CLR     FAC1(R5)
  319 001136' 000137 0000000G            JMP     @#OPRATOR
  320 001142' 000137 0000000G        ERPOSA: JMP     @#ERRARG
  321 001146' 000137 0000000G        ERPOSS: JMP     @#ERRSYN
  322                                POSFNE:
  323
  324
```



```
  325                                ; SEG FUNCTION ROUTINE
  326 001152' 004737 0000000G        SEG.FN: JSR     PC,@#EVAL
  327 001156' 103114                     BCC     ERSEGA
  328 001160' 122127 0000000G            CMPB    (R1)+,#,COMMA
  329 001164' 001113                     BNE     ERSEG$
  330 001166' 004737 0000000G            JSR     PC,@#EVAL
  331 001172' 103506                     BCS     ERSEGA
  332 001174' 004737 0000000G            JSR     PC,@#INT
  333 001200' 016546 0000000G            MOV     FAC1(R5),-(SP)
  334 001204' 016546 0000000G            MOV     FAC2(R5),-(SP)
  335 001210' 122127 0000000G            CMPB    (R1)+,#,COMMA
  336 001214' 001077                     BNE     ERSEG$
  337 001216' 004737 0000000G            JSR     PC,@#EVAL
  338 001222' 103472                     BCS     ERSEGA
  339 001224' 004737 0000000G            JSR     PC,@#INT
  340 001230' 122127 0000000G            CMPB    (R1)+,#,RPAR
  341 001234' 001067                     BNE     ERSEG$
  342                                ;GET X VALUE IN R2
  343 001236' 012602                     MOV     (SP)+,R2
  344 001240' 012600                     MOV     (SP)+,R0
  345 001242' 100403                     BMI     SEGX0
  346 001244' 001055                     BNE     SEGNUL
  347 001246' 005702                     TST     R2
  348 001250' 003002                     BGT     SEGL
  349 001252' 012702 000001          SEGX0: MOV     #1,R2
  350                                ;COMPUTE LENGTH OF AS IN R0
  351 001256' 005000                 SEGL:  CLR     R0
  352 001260' 021627 177777              CMP     (SP),#177777    ;CHECK NULL STRING
  353 001264' 157600 000000              BISB    @(SP),R0
  354                                ;GET Y VALUE IN R3
  355 001270' 005765 0000000G        SEGTY: TST     FAC1(R5)
  356 001274' 100441                     BMI     SEGNUL
  357 001276' 001402                     BEQ     SEGTY2
  358 001300' 010003                     MOV     R0,R3
  359 001302' 000403                     BR      SEGRNG
  360 001304' 016503 0000000G        SEGTY2: MOV     FAC2(R5),R3
  361 001310' 003433                     BLE     SEGNUL
  362                                ;CHECK 0<=R2<=R3<=R0
  363 001312' 020003                 SEGRNG: CMP     R0,R3
  364 001314' 101001                     BHI     SEGR2
  365 001316' 010003                     MOV     R0,R3
  366 001320' 020203                 SEGR2:  CMP     R2,R3
  367 001322' 101026                     BHI     SEGNUL
  368                                ;COMPUTE LENGTH OF OUTPUT STRING
  369 001324' 160203                     SUB     R2,R3
  370 001326' 005203                     INC     R3
  371                                ;MAKE NEW STRING OF THE CORRECT LENGTH
  372 001330' 010246                     MOV     R2,-(SP)        ;SAVE START CHAR
  373 001332' 010502                     MOV     R5,R2
  374 001334' 010346                     MOV     R3,-(SP)
  375 001336' 004737 0000000G            JSR     PC,@#MAKESTR
  376                                ;FIX STACK AND MOVE IN CHARS FROM OLD STRING
  377 001342' 012602                     MOV     (SP)+,R2        ;NEW STRING POINTER
  378 001344' 012600                     MOV     (SP)+,R0        ;START CHAR
  379 001346' 061600                     ADD     (SP),R0         ;ADD OLD STR POINTER
```

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```
                                        MOV     R2,(SP)         ;SAVE NEW STRING
                                        CLR     R3
                                        BISB    (R2),R3         ;R3 IS NEW STRING LENGTH
                                        ADD     #3,R2           ;ADDR FIRST CHAR IN NEW STR
                                        ADD     #2,R0           ;ADDR START CHAR IN OLD STR
                                SEGLP:  MOVB    (R0)+,(R2)+     ;FILL IN NEW STRING
                                        DEC     R3
                                        BNE     SEGLP
                                        JMP     @#STPNO
                                ;OUTPUT NULL STRING
                                SEGNUL: MOV     #177777,(SP)
                                SEGX:   JMP     @#$OPRATR
                                ERSEGA: JMP     @#ERRARG
                                ERSEGS: JMP     @#ERR$YN
                                SEGFNE:
```



```
                                ; VAL FUNCTION ROUTINE
                                VALFN:  JSR     PC,@#EVAL
                                        BCC     ERVALA
                                        CMPB    (R1)+,#,RPAR
                                        BNE     ERVAL$
                                ;READ STRING
                                        MOV     (SP),R0
                                        CMP     R0,#177777      ;CHECK NULL STRING
                                        BNE     VALR
                                        CLR     FAC1(R5)
                                        CLR     FAC2(R5)
                                        TST     (SP)+
                                        BR      VALJ
                                VALR:   CLR     R2
                                        BISB    (R0),R2
                                        MOV     R2,(SP)
                                        ADD     #3,R0
                                        ADD     R0,R2
                                        CLRB    (R2)
                                        MOV     R4,-(SP)
                                        MOV     R1,-(SP)
                                        MOV     R2,-(SP)
                                ;READ ASCII NUMBER AND EXPONENT
                                        JSR     PC,@#VAL
                                ;NORMALIZE TO FORM FLT PT NUMBER
                                        JSR     PC,@#NORM
                                        MOV     R3,FAC1(R5)
                                        MOV     R4,FAC2(R5)
                                ;CHECK END OF STRING
                                VALCE:  TSTB    (R0)
                                        BEQ     VALX
                                        CMPB    (R0)+,#BL
                                        BEQ     VALCE
                                ;RESTORE REGS AND RETURN TO EVAL
                                VALX:   CMP     R0,(SP)+
                                        BNE     ERVALA
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R4
                                        MOV     (SP)+,R2
                                        MOVB    R2,(R0)         ;RESTORE STRING LENGTH
                                VALJ:   JMP     @#$OPRATOR
                                ERVALS: JMP     @#ERR$YN
                                ERVALA: JMP     @#ERRARG
                                VALFNE:
```

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```
                                        ; STR FUNCTION ROUTINE
001566' 004737 0000000G         STRFN1: JSR     PC,@#EVAL
001572' 103432                          BCS     ERSTRA
001574' 122127 0000000                  CMPB    (R1)+,#',RPAR
001600' 001031                          BNE     ERSTR$
001602' 012746 000020                   MOV     #20,-(SP)
001606' 010502                          MOV     R5,R2
001610' 004737 0000000G                 JSR     PC,@#MAKESTR
001614' 011603                          MOV     (SP),R3
001616' 062703 000003                   ADD     #3,R3
001622' 010365 0000000G                 MOV     R3,T2(R5)
001626' 005065 0000000G                 CLR     T1(R5)
001632' 004737 0000000G                 JSR     PC,@#NUMSGN
001636' 0000000G                        ,WORD   $AVCHAR
001640' 010602                          MOV     SP,R2
001642' 016546 0000000G                 MOV     T1(R5),-(SP)
001646' 004737 0000000G                 JSR     PC,@#MAKESTR
001652' 012616                          MOV     (SP)+,(SP)
001654' 000137 0000000G                 JMP     @#STPRO         ;PROTECT STRING

001660' 000137 0000000G         ERSTRA: JMP     @#ERRARG
001664' 000137 0000000G         ERSTR$: JMP     @#ERR$YN
                                STRFNE:
                                FNEND:
```



```
                                        ;
                                        ;
                                        ; USER AREA STORAGE CELLS
                                        ;
001670' 000000                  USR:    ,WORD   0               ;SYMBOLS
001672' 000000                          ,WORD   0               ;LIMIT
001674' 000000                          ,WORD   0               ;PDL
001676' 000000                          ,WORD   0               ;POSIZE
001700' 000000                          ,WORD   0               ;ARRAYS
001702' 000000                          ,WORD   0               ;HIFREE
001704' 000000                          ,WORD   0               ;LOFREE
001706' 002214'                         ,WORD   USRCODE         ;CODE
001710' 002274'                         ,WORD   USRLINE         ;LINE
001712' 000000                          ,WORD   0               ;VARSAV
001714' 000000                          ,WORD   0               ;$S1SAV
001716' 000000                          ,WORD   0               ;$S2SAV
001720' 000000                          ,WORD   0               ;LINENO
001722' 000000                          ,WORD   0               ;GSBCTR
001724' 000000                          ,WORD   0               ;COLUMN
001726' 000000                          ,WORD   0               ;CLMNTTY
001730' 000000                          ,WORD   0               ;FAC1
001732' 000000                          ,WORD   0               ;FAC2
001734' 000000                          ,WORD   0               ;R0SAVE
001736' 000000                          ,WORD   0               ;R1SAVE
001740' 000000                          ,WORD   0               ;R2SAVE
001742' 000000                          ,WORD   0               ;R3SAVE
001744' 000000                          ,WORD   0               ;R4SAVE
001746' 000000                          ,WORD   0               ;T1
001750' 000000                          ,WORD   0               ;T2
001752' 000000                          ,WORD   0               ;T3
001754' 000000                          ,WORD   0               ;RND1
001756' 000000                          ,WORD   0               ;RND2
001760' 000000                  RAND1:  ,WORD   0               ;RNDCT
001762' 000000                          ,WORD   0               ;LOSTR
001764' 000000                          ,WORD   0               ;HISTR
001766' 000                             ,BYTE   0               ;ODEV
001767' 000                             ,BYTE   0               ;IDEV
001770' 002840'                         .       TPBFH1          ;TPHD
001772' 002004'                         .       KBBFH1          ;KBHD
001774' 000000                          ,WORD   0               ;ECHOSP
001776' 000                             ,BYTE   0               ;CNCFLG
001777' 000                             ,BYTE   0               ;CNOFLG
002000' 000                             ,BYTE   0               ;FILLCO
002001' 000                             ,BYTE   0               ;FILLNO
002002' 000                             ,BYTE   0               ;FILLCH
002003' 000                             ,BYTE   0               ; [SPARE BYTE]
```

```
                                        ;
                                        ; USER I/O BUFFER AND BUFFER HDR, SPACE (TTY)
                                        ;
002004' 002020'                 KBDFH1: .       KBBUF1          ;BSTRT
002006' 002037'                         .       KBBEN1          ;BEND
002010' 002020'                         .WORD   KBBUF1          ;BGET1
002012' 002020'                         .WORD   KBBUF1          ;BGET2
002014' 002020'                         .WORD   KBBUF1          ;BPUT
002016' 000000                          .       0               ;BFSPEC
        002020'                 KBBUF1: .;
        002040'                 .       .+$KBBSE                ;DEFAULT SIZE = 20 CHARS.
        002037'                 KBBEN1: .;=.+1
                                        .EVEN
                                        ;
002040' 002054'                 TPBFH1: .       TPBUF1          ;BSTRT
002042' 002073'                         .       TPBEN1          ;BEND
002044' 000000                          .       0               ;BGET1 (NOT USED)
002046' 002054'                         .WORD   TPBUF1          ;BGET2
002050' 002054'                         .WORD   TPBUF1          ;BPUT
002052' 000000                          .       0               ;BFSPEC
        002054'                 TPBUF1: .;
        002074'                 .       .+$TPBSE                ;DEFAULT = 20 CHARS.
        002073'                 TPBEN1: .;=.+1
                                        .EVEN
                                USRLINE:
        002214'                 .;=.+$ULNSP                     ;DEFAULT = 128
                                USRCODE:
```



```
                                        ;
                                        ; *-ONCE-ONLY INIT, CODE
                                        ;   FIND OUT HOW MUCH CORE AND EXPAND USRAREA ACCORDINGLY
                                        ;
002214' 162704  017770          DECCORE:SUB     #17770,R4       ;COME HERE ON TRAP FOR BAD MEM,
002220' 022626                          CMP     (SP)+,(SP)+
002222' 000412                          BR      TRYCORE         ;  REF'S, AND DEC, CORE SIZE
                                        ;
002224' 000005                  ONCE-ONLY:RESET
002226' 012706  003364'                 MOV     #TMPSTCK,SP     ;TEMP, STACK
002232' 004767  000000G                 JSR     PC,.FPMP        ;INIT FOR FPMP ROUTINES
002236' 012737  002214' 000004          MOV     #DECCORE,@#4    ;SET UP TRAP ADDR,
002244' 012704  160000                  MOV     #160000,R4      ;28K
002250' 005744                  TRYCORE:TST     -(R4)           ;TRAPS TO DECCORE IF BAD ADDR
002252' 012737  000000  000004          MOV     #0,@#4          ;FALLS THRU IF OK = RESTORE TRAP ADDR,
002260' 010467  001100                  MOV     R4,HICORE
                                        ;
                                        ;INITIALIZE TOP OF BASIC
002264' 012701  000002'                 MOV     #.BASIC,R1
                                        ;PRINT HEADING AND READ ANSWER
002270' 004367  000736          INIHO:  JSR     R3,PRMSG
002274'    015     012                  .BYTE   15,12
002276' 040502  044523  020103          .ASCII  'BASIC V00(A'
        002304' 030126  030460     101
002311'    015     012                  .BYTE   15,12
002313'    117  052120  043040          .ASCII  'OPT ENS: A=ALL, N=NONE, I=INDV'
        002320' 051516  020072  026501
        002326' 046101  026114  047040
        002334' 047055  047117  026105
        002342' 044440  044455  042116
002350'    015     012                  .BYTE   15,12
002352'    077                          .ASCII  '?'
002353'    000                          .BYTE   0
                                        .EVEN
002354' 004767  000722                  JSR     PC,RDANS
002360' 120027  000116                  CMPB    R0,#'N          ;CHECK FOR N
002364' 001512                          BEQ     INISAV
002366' 005002                          CLR     R2              ;CLEAR ALL FLAG
002370' 120027  000101                  CMPB    R0,#'A          ;CHECK FOR A
002374' 001002                          BNE     INI1
002376' 005202                          INC     R2              ;SET ALL FLAG
002400' 000415                          BR      INIALL
002402' 120027  000111          INI1:   CMPB    R0,#'I          ;CHECK FOR I
002406' 001330                          BNE     INIHO
                                        ;PRINT HEADING FOR INDIV FUNCTIONS
002410' 004367  000636                  JSR     R3,PRMSG
002414'    015     012     012          .BYTE   15,12,12
002417'    040  026531  042531          .ASCII  ' Y=YES  N=NO'
        002424' 020123  047040  047055
002432'    117
002433'    000                          .BYTE   0
002434' 012705  003374'         INIALL: MOV     #ENTAB,R5
002440' 012704  000000G                 MOV     #TABLES,R4
                                        ;GET NEXT FUNCTION TABLE ADDRESS
002444' 011503                  INILP:  MOV     (R5),R3
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 593  002446' 100005                         BPL     INIFN
 594  002450' 062705  000002                 ADD     #2,R5           ;SKIP A FUNCTION
 595  002454' 062704  000002                 ADD     #2,R4
 596  002460' 000771                         BR      INILP
 597                                 ;PRINT QUESTION FOR FUNCTION, GET ANSWER
 598  002462' 020427  000000G        INIFN:  CMP     R4,#TBLEND
 599  002466' 101031                         BHI     INISAV
 600  002470' 020527  003944'                CMP     R5,#FNTABE
 601  002474' 103046                         BHIS    INISAV
 602  002476' 005702                         TST     R2
 603  002500' 001027                         BNE     INIDF
 604  002502' 016567  000004  000014         MOV     4(R5),FNNAM1
 605  002510' 016567  000006  000016         MOV     6(R5),FNNAM2
 606  002516' 004367  000530                 JSR     R3,PRMSG
 607  002522'    015     012                 .BYTE   15,12
 608  002524' 000000                 FNNAM1: .WORD   0
 609  002526' 000000                 FNNAM2: .WORD   0
 610  002530' 039040     040                 .ASCII  ' ) '
 611  002533'    000                         .BYTE   0
 612                                         .EVEN
 613  002534' 004767  000542                 JSR     PC,RDANS
 614  002540' 120027  000116                 CMPB    R0,#'N          ;CHECK FOR N
 615  002544' 001002                         BNE     INITY
 616  002546' 005724                         TST     (R4)+
 617  002550' 000413                         BR      ININXT
 618  002552' 120027  000131         INITY:  CMPB    R0,#'Y          ;CHECK FOR Y
 619  002556' 001341                         BNE     INIFN
 620                                 ;DEFINE THE FUNCTION
 621  002560' 010100                 INIDF:  MOV     R1,R0
 622  002562' 162700  0000000                SUB     #TABLE5,R0
 623  002566' 010024                         MOV     R0,(R4)+        ;PLACE ADDRESS IN TABLE
 624  002570' 012321                 INIMV:  MOV     (R3)+,(R1)+
 625  002572' 020365  000002                 CMP     R3,2(R3)
 626  002576' 103774                         BLO     INIMV
 627  002600' 062705  000010         ININXT: ADD     #10,R5
 628  002604' 020427  000000G                CMP     R4,#TBLEND
 629  002610' 101715                         BLOS    INILP
 630
 631                                 ;SAVE TOP OF BASIC
 632  002612' 010167  175162         INISAV: MOV     R1,USRAREA
 633                                 ;MOVE USER AREA TO TOP OF BASIC
 634  002616' 012702  001000'                MOV     #USR,R2
 635  002622' 010203                         MOV     R2,R3           ;COMPUTE RELOCATION CONSTANT
 636  002624' 160103                         SUB     R1,R3
 637  002626' 020227  002214'        MOVLP:  CMP     R2,#USRCODE
 638  002632' 103005                         BHIS    MOVDON
 639  002634' 012221                         MOV     (R2)+,(R1)+
 640  002636' 001773                         BEQ     MOVLP
 641  002640' 160341                         SUB     R3,-(R1)        ;RELOCATE NON-ZERO ENTRIES
 642  002642' 005721                         TST     (R1)+
 643  002644' 000770                         BR      MOVLP
 644                                 MOVDON:
 645
```

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 646
 647                                 ;INITIALIZE USER AREA
 648  002646' 016704  000512                 MOV     HICORE,R4       ;R4 IS HIGHEST ADDR, IN CORE
 649  002652' 162704  000300                 SUB     #300,R4
 650  002656' 016705  175116                 MOV     USRAREA,R5
 651  002662' 010465  0000000                MOV     R4,LIMIT(R5)
 652  002666' 162704  000134                 SUB     #134,R4         ;POINTER SPACE
 653  002672' 010465  0000006                MOV     R4,FDL(R5)      ;BASE OF STACK
 654  002676' 162704  000006G                SUB     #STKSZ,R4       ;MAX. STACK SIZE
 655  002702' 010465  0000006G               MOV     R4,ARRAYS(R5)   ;HIEST ARRAY STOR. LOC.
 656  002706' 062704  000040                 ADD     #40,R4
 657  002712' 010465  0000000                MOV     R4,POSIZE(R5)
 658  002716' 012765  032331  0000000        MOV     #32331,RND1(R5)
 659  002724' 012765  163291  0000000        MOV     #163291,RND2(R5)
 660
 661                                 ;DIALOGUE TO SET UP TERMINAL TYPE
 662  002732' 005003                 ASKSER: CLR     R3
 663  002734' 004367  000312                 JSR     R3,PRMSG
 664  002740'    015     012     012         .BYTE   15,12,12
 665  002743'    106  051501  020124         .ASCII  'FAST SER TERM?'
      002750' 042523  020122  042524
      002756' 046522     077
 666  002761'    000                         .BYTE   0
 667                                         .EVEN
 668  002762' 004767  000314                 JSR     PC,RDANS
 669  002766' 120027  000116                 CMPB    R0,#'N
 670  002772' 001457                         BEQ     ASKOON
 671  002774' 120027  000131                 CMPB    R0,#'Y
 672  003000' 001354                         BNE     ASKSER
 673  003002' 005203                         INC     R3
 674
 675  003004' 004367  000242         ASKLA:  JSR     R3,PRMSG
 676  003010'    015     012                 .BYTE   15,12
 677  003012' 040514  030063  024040         .ASCII  'LA36 (300 BAUD)?'
      003020' 030063  020060  040502
      003026' 042125  037451
 678  003032'    000                         .BYTE   0
 679            003034'                      .EVEN
 680  003034' 004767  000242                 JSR     PC,RDANS
 681  003040' 120027  000131                 CMPB    R0,#'Y
 682  003044' 001432                         BEQ     ASKOON
 683  003046' 120027  000116                 CMPB    R0,#'N
 684  003052' 001354                         BNE     ASKLA
 685  003054' 005203                         INC     R3
 686
 687  003056' 004367  000170         ASKVT:  JSR     R3,PRMSG
 688  003062'    015     012                 .BYTE   15,12
 689  003064' 052126  032460  024040         .ASCII  'VT05 (>=600 BAUD)?'
      003072' 036476  030060  020060
      003100' 040502  042125  037451
 690  003106'    000                         .BYTE   0
 691            003110'                      .EVEN
 692  003110' 004767  000166                 JSR     PC,RDANS
 693  003114' 120027  000131                 CMPB    R0,#'Y
 694  003120' 001404                         BEQ     ASKOON
```

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695  003122' 120027 000110          CMPB    R0,#'N
696  003126' 001353                 BNE     ASKVT
697  003130' 000700                 BR      ASKSER
698
699  003132' 010302          ASKDON: MOV     R3,R2
700  003134' 001412                 BEQ     FILLDON
701  003136' 006303                 ASL     R3
702  003140' 060302                 ADD     R3,R2
703  003142' 062702 003303'         ADD     #FILLTB,R2
704  003146' 010503                 MOV     R5,R3
705  003150' 062703 000000G         ADD     #FILLCO,R3
706  003154' 112223                 MOVB    (R2)+,(R3)+
707  003156' 112223                 MOVB    (R2)+,(R3)+
708  003160' 112223                 MOVB    (R2)+,(R3)+
709                         FILLDON:
710                         ;PRINT OUT IF USER FUNCTIONS LOADED
711  003162' 005737 000046          TST     @#46
712  003166' 001414                 BEQ     NOUSR
713  003170' 004367 000056          JSR     R3,PRMSG
714  003174'    015    012    012          ,BYTE   15,12,12
715  003177'    125 042523 020122          ,ASCII  'USER FNS LOADED'
     003204' 047106 020123 047514
     003212' 042101 042105
716  003216'    000                 ,BYTE 0
717         003220'                 ,EVEN
718                         NOUSR:
719  003220' 004367 000026          JSR     R3,PRMSG
720  003224'    015    012    012          ,BYTE   15,12,12,0
     003227'    000
721                                 ,EVEN
722
723                         ;CHECK IF RNDL LOADED
724  003230' 012702 000000G         MOV     #TABLES,R2
725  003234' 012203                 MOV     (R2)+,R3
726  003236' 001403                 BEQ     NORND
727  003240' 062703 000014          ADD     #RNDFN-RNDLFN,R3
728  003244' 010312                 MOV     R3,(R2)         ;DEFINE RND ALSO
729                         NORND:
730  003246' 000167 000000G         JMP     START
731
732                         ;SUBROUTINE TO PRINT A MESSAGE
733  003252' 010300          PRMSG:  MOV     R3,R0
734  003254' 105737 177564G PRLP:   TSTB    @#TPS+2
735  003260' 100375                 BPL     PRLP
736  003262' 112037 000000G         MOVB    (R0)+,@#TPB
737  003266' 001372                 BNE     PRLP
738  003270' 010003                 MOV     R0,R3
739  003272' 005203                 INC     R3
740  003274' 006203                 ASR     R3
741  003276' 006303                 ASL     R3
742  003300' 000203                 RTS     R3
743
744                         ;SUBROUTINE TO READ ANSWER FROM TELETYPE
745  003302' 005267 176452 RDANS:  INC     RAND
746  003306' 105737 000000G         TSTB    @#TKS
```

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747  003312' 100373                 BPL     RDANS
748  003314' 113700 000002G         MOVB    @#TKS+2,R0
749  003320' 042700 177600          BIC     #177600,R0
750  003324' 010067 000004          MOV     R0,INCH
751  003330' 004367 177716          JSR     R3,PRMSG
752  003334' 000000          INCH:   .WORD   0
753  003336' 016700 177772          MOV     INCH,R0
754  003342' 000207                 RTS     PC
755         003364'                 .       =.+20
756                         TMPSTCK:
757  003364' 000000         HICORE: .WORD   0
758
759         003363'                 FILLTB=.-3
760  003366'    000     011     015         .BYTE   0,11,15         ;LA30
761  003371'    000     004     012         .BYTE   0,04,12         ;VT05
762
763                         FNTAB:
764  003374' 000002'                .WORD   RNDLFN
765  003376' 000140'                .WORD   RNDFNE
766  003400' 047122 020104          .ASCII  'RND '
767  003404' 177777                 .WORD   -1              ; RND
768  003406' 177777                 .WORD   -1              ; SIN
769  003410' 177777                 .WORD   -1              ; COS
770  003412' 177777                 .WORD   -1              ; SQR
771  003414' 177777                 .WORD   -1              ; ATN
772  003416' 177777                 .WORD   -1              ; EXP
773  003420' 177777                 .WORD   -1              ; LOG
774  003422' 000140'                .WORD   ABSFN           ; ABS
775  003424' 000236'                .WORD   ABSFNE
776  003426' 041101 020123          .ASCII  'ABS '
777  003432' 177777                 .WORD   -1              ; INT
778  003434' 000236'                .WORD   SGNFN           ; SGN
779  003436' 000324'                .WORD   SGNFNE
780  003440' 043523 020116          .ASCII  'SGN '
781  003444' 000324'                .WORD   TABFN           ; TAB
782  003446' 000436'                .WORD   TABFNE
783  003450' 040524 020102          .ASCII  'TAB '
784  003454' 000436'                .WORD   LENFN           ; LEN
785  003456' 000518'                .WORD   LENFNE
786  003460' 042514 020116          .ASCII  'LEN '
787  003464' 000518'                .WORD   ASCFN           ; ASC
788  003466' 000574'                .WORD   ASCFNE
789  003470' 051501 020103          .ASCII  'ASC '
790  003474' 000574'                .WORD   CHRSFN          ; CHR$
791  003476' 000646'                .WORD   CHRFNE
792  003500' 044103 022122          .ASCII  'CHR$'
793  003504' 000646'                .WORD   POSFN           ; POS
794  003506' 001152'                .WORD   POSFNE
795  003510' 047520 020123          .ASCII  'POS '
796  003514' 001152'                .WORD   SEGFN           ; SEG
797  003516' 001428'                .WORD   SEGFNE
798  003520' 042523 022107          .ASCII  'SEG$'
799  003524' 001428'                .WORD   VALFN           ; VAL
800  003526' 001566'                .WORD   VALFNE
801  003530' 040526 020114          .ASCII  'VAL '
```

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  882  003534' 001566'                    ,WORD   STRFN          ; STR
  883  003536' 001678'                    ,WORD   STRFNE
  884  003540' 052123  022122             ,ASCII  /STRS/
  885                            FNTABE:
  886
  887          002224'                    ,END    ONCEON
```



```
ABSFN    000140R     ABSFNE   000236R     ABSINT   000174R     ABSX     000222R
ARGB   = ******  G   ARRAYS  = ******  G  ASCFN    000510R     ASCFNE   000974R
ASKDON   003132R     ASKLA    003084R     ASKSER   002732R     ASKVT    003050R
BASICH   000002R     BL     = 000040      CHRFNE   000646R     CHRSFN   000974R
COLUMN = ******  G   DECCOR   002214R     ERABSA   000226R     ERABSS   000232R
ERASCA   000564R     ERASCS   000570R     ERCHRS   000642R     ERLENA   000500R
ERLENS   000504R     ERPOSA   001142R     ERPOSS   001144R     ERRARG = ******  G
ERRMIX = ******  G   ERRNDA   000134R     ERRNDS   000130R     ERRPDL = ******  G
ERRSYN = ******  G   ERSEGA   001410R     ERSEGS   001414R     ERSGNA   000310R
ERSGNS   000320R     ERSTRA   001660R     ERSTRS   001664R     ERTABS   000432R
ERVALA   001562R     ERVALS   001556R     EVAL   = ******  G   FAC1   = ******  G
FAC2   = ******  G   FILLCO = ******  G   FILLDO   003102R     FILLTB = 003306R
FNEND    001670R     FNNAM1   002524R     FNNAM2   002526R     FNTAB    003374R
FNTABE   003544R     HICORE   003364R     IFPMP  = ******  G   INCH     003334R
INIALL   002434R     INIOF    002560R     ININFN   002402R     INIHD    002270R
INILP    002444R     INIMV    002570R     ININXT   002600R     INISAV   002012R
INITI    002402R     INITY    002552R     INT    = ******  G   KBBFN1 = 002037R
KBBFH1   002004R     KBBUF1 = 002020R     LENFN    000436R     LENFNE   000510R
LIMIT  = ******  G   MAKEST = ******  G   MOVDON   002644R     MOVLP    002620R
NORM   = ******  G   NORND    003246R     NOUSR    003220R     NUMSGN = ******  G
ONCEON   002224R     OPRATO = ******  G   PC     =%000007      POL    = ******  G
POSIZE = ******  G   POSF     001124R     POSFN    000646R     POSFNE   001152R
POSFST   001050R     POSF2    001126R     POSNO    001116R     POSNXT   001076R
POSREM   001070R     POSTRY   001054R     POSX     000754R     POSY     001000R
PRLP     003254R     PRMSG    003252R     RAND     001700R     RDANS    003302R
REXP     000074R     RNDFN    000014R     RNDFNE   000148R     RNDFN2   000016R
RNDLFN   000002R     RND1   = ******  G   RND2   = ******  G   RNORM    000002R
RPLUS    000052R     R0     =%000000      R1     =%000001      R2     =%000002
R3     =%000003      R4     =%000004      R5     =%000005      SAVCHA = ******  G
SEGFN    001152R     SEGFNE   001420R     SEGL     001256R     SEGLP    001366R
SEGNUL   001400R     SEGRNG   001312R     SEGR2    001320R     SEGTY    001270R
SEGTY2   001304R     SEGX     001404R     SEGX8    001252R     SGNFLT   000270R
SGNFN    000236R     SGNFNE   000324R     SGNPOS   000270R     SGNX     000310R
SOPRAT = ******  G   SP     =%000006      START  = ******  G   STPRO  = ******  G
STRFN    001566R     STRFNE   001670R     TAB8     000344R     TABC     000360R
TABFN    000324R     TABFNE   000436R     TABLE3 = ******  G   TABNON   000376R
TABNUL   000426R     TBL5EN = ******  G   TK3    = ******  G   TMPSTC   003364R
TPB    = ******  G   TPBEN1 = 002073R     TPBFH1   002040R     TPBUF1 = 002056R
TRYCOR   002258R     T1     = ******  G   T2     = ******  G   T3     = ******  G
USR      001670R     USRARE   000000RG    USRCOD   002214R     USRLIN   002076R
VAL    = ******  G   VALCE    001524R     VALFN    001420R     VALFNE   001566R
VALJ     001552R     VALR     001460R     VALX     001536R     $KBBSZ = 000020
$STKSZ = ******  G   $TPBSZ = 000020      $ULNSP = 000120      ,COMMA = ******  G
,RPAR  = ******  G   .      = 003544R
```

ERRORS DETECTED: 0

520

RUN-TIME: 18 SECONDS
CORE USED: 3K

ABSFN	128#	774											
ABSFNE	138#	775											
ABSINT	125	129#											
ABSX	126	128	138	132	135#								
ARGB	41	164	229										
ARRAYS	35	655											
ASCFN	211#	787											
ASCFNE	226#	788											
ASKDON	678	682	694	699#									
ASKLA	675#	684											
ASKSER	662#	672	697										
ASKVT	687#	696											
BASICH	76#	563											
BL	73#	185	428										
CHRFNE	248#	791											
CHRSFN	229#	798											
COLUMN	37	173											
DECCOR	549#	556											
ERABSA	121	136#											
ERABSS	123	137#											
ERASCA	212	217	219	224#									
ERASCS	214	225#											
ERCHRS	231	239#											
ERLENA	195	205#											
ERLENS	197	206#											
ERPOSA	245	249	253	328#									
ERPOSS	247	251	256	321#									
ERRARG	38	116	136	158	285	224	328	392	439	463			
ERRMIX	38												
ERRNOA	80	116#											
ERRNOS	82	115#											
ERRPOL	38												
ERRSYN	38	115	137	159	189	286	225	239	321	393	438	464	
ERSEGA	327	331	338	392#									
ERSEGS	329	336	341	393#									
ERSGNA	143	158#											
ERSGNS	145	159#											
ERSTRA	445	463#											
ERSTRS	447	464#											
ERTABS	166	189#											
ERVALA	399	432	439#										
ERVALS	401	438#											
EVAL	39	79	128	142	194	211	244	248	252	326	338	337	398	444
FAC1	37	112	124	127	133	147	159	198	228	298	318	333	355	496
	423													
FAC2	37	113	129	131	134	149	159	168	199	283	221	222	232	237
	268	262	317	334	368	487	424							
FILLCO	33	785												
FILLDO	780	789#												
FILLTB	783	759#												
FNEND	466#													
FNNAM1	604	608#												
FNNAM2	605	609#												

522

FNTAB 589 763#
FNTABE 600 805#
HICORE 568 648 757#
IFPMP 44 555
INCH 750 752# 753
INIALL 581 589#
INIDF 603 621#
INIFN 593 598# 619
INIHD 565# 583
INILP 592# 596 629
INIMV 624# 626
ININXT 617 627#
INISAV 576 599 601 632#
INITI 579 582#
INITY 615 618#
INT 39 254 332 339
KBBEN1 521 528#
KBBFH1 508 522#
KBBUF1 520 522 523 524 526#
LENFN 194# 784
LENFNE 207# 785
LIMIT 35 691
MAKEST 39 100 235 375 458 459
MOVDON 638 644#
MOVLP 637# 640 643
NORM 42 422
NORND 726 729#
NOUSR 712 718#
NUMSGN 41 455
ONCEON 553# 807
OPRATO 39 114 135 157 284 223 319 437
PC 72# 79 120 142 164 180 194 211 229 235 244 248 252 254
326 338 332 337 339 375 398 428 422 444 458 455 459 555
574 613 668 688 692 754
POL 35 693
POSIZE 35 657
POSF 259 261 267 276 278 387 310#
POSF2 301 317#
POSFN 244# 793
POSFNE 322# 794
POSFST 295# 299
POSNO 309 312#
POSNXT 306# 311
POSREM 296 303#
POSTRY 297# 314
POSX 265 269#
POSY 273 280#
PRLP 734# 735 737
PRMSG 565 585 600 663 675 687 713 719 733# 791
R0 65# 84 85 86 87 90 91 93 96 97 98 102 108 146
152 154 155 181 183 184 185 236 237 257 262 266 275 277
292 297 300 317 344 351 353 358 363 365 378 379 384 385
403 404 411 413 414 426 428 431 436 575 578 582 614 618

621 622 623 669 671 681 683 693 695 733 736 738 748 749
750 753
R1 66# 81 122 144 165 196 213 230 246 298 255 328 335 340
400 417 433 446 563 621 624 632 636 639 641 642
R2 67# 87 89 90 92 93 95 97 100 105 107 108 109 110
112 179 182 183 186 200 201 203 215 216 218 222 234 269
270 275 277 288 289 290 291 292 293 295 298 303 308 310
313 343 347 349 366 369 372 373 377 380 382 383 385 410
411 412 414 415 418 435 438 449 457 577 580 602 634 635
637 639 699 702 703 706 707 708 724 725 728
R3 68# 86 88 91 96 99 104 105 106 111 113 280 281 282
283 284 285 286 295 304 305 306 310 312 358 360 363 365
366 369 370 374 381 382 386 423 451 452 453 565 585 592
606 624 625 635 636 641 662 663 673 675 685 687 699 701
702 704 705 706 707 708 713 719 725 727 728 733 738 739
740 741 742 751
R4 69# 416 424 434 549 557 558 560 590 595 598 616 623 628
648 649 651 652 653 654 655 656 657
R5 70# 84 112 113 124 127 129 131 133 134 147 149 155 156
168 173 179 198 199 203 220 221 222 232 234 237 258 260
262 284 290 298 306 308 317 318 333 334 355 360 373 406
407 423 424 449 453 454 458 589 592 594 600 604 605 625
627 650 651 653 655 657 658 659 784
RAND 502# 745
RDANS 574 613 668 680 692 745# 747
REXP 101 104#
RND1 43 658
RND2 43 85 659
RNDFN 83# 727
RNDFN2 84#
RNDFNE 117# 765
RNDLFN 79# 727 764
RNORM 99# 103
RPLUS 94 96#
SAVCHA 41 456
SEGFN 326# 796
SEGFNE 394# 797
SEGL 348 351#
SEGLP 385# 387
SEGNUL 346 356 361 367 390#
SEGR2 364 366#
SEGRNG 359 363#
SEGTY 355#
SEGTY2 357 360#
SEGX 391#
SEGX0 345 349#
SGNFLT 148 151#
SGNFN 142# 778
SGNFNE 160# 779
SGNPOS 151 154#
SGNX 150 157#
SOPRAT 39 188 238 391
SP 71# 167 168 169 171 173 175 177 181 200 215 233 236 264

524

525

```
            270     272     281     282     285     288     291     303     304     312     313     316     333     334
            343     344     352     353     372     374     377     378     379     388     398     403     408     412
            416     417     418     431     433     434     435     448     491     497     458     468     558     554
START        33     738
STPRO        41     388     401
STRFN      444#     802
STRFNE     465#     803
T1           48     278     298     388     454     458
T2           48     284     388     453
T3           48
TABB       169#     172
TABC       178     173#
TABFN      164#     781
TABFNE     198#     782
TABLE5       36     598     622     724
TABNON     176     179#
TABNUL     178     188#
TBL5EN       36     598     628
TKS          32     746     748
TMPSTC     554     756#
TPB          32     734     736
TPBEN1     532     539#
TPBFH1     587     531#
TPBUF1     531     534     535     537#
TRYCOR     551     558#
USR        474#     634
USRARE       34      75#    632     658
USRCOD     481     543#    637
USRLIN     482     541#
VAL          42     428
VALCE      426#     429
VALFN      398#     799
VALFNE     448#     888
VALJ       489     437#
VALR       485     418#
VALX       427     431#
,          153     174     187     282     526     527#    528     537     538#    539     542#    755#    759
,COMMA      48     246     258     328     335
,RPAR       37      81     122     144     165     196     213     238     255     348     488     446
SKBBSZ      56     527
SSTKSZ      44     654
STPBSZ      52     538
SULNSP      68     542
```

```
LNKX11   V021   22-MAR-73   10:22

#BASIC,NOSMAP',DRK<BASIC,FPMP,BASICH/B18/E

LOAD MAP

TRANSFER ADDRESS: 030150
LOW LIMIT: 000000
HIGH LIMIT: 031478
**********
MODULE  BASICL
SECTION ENTRY   ADDRESS SIZE
<. ABS.>        000000  000000
        ARGB    011650
        ARRAYS  000010
        COLUMN  000034
        ERRARG  007734
        ERRMIX  011650
        ERRPOL  011120
        ERRSYN  011650
        EVAL    010616
        FAC1    000040
        FAC2    000042
        FILLCO  000110
        GETVAR  013604
        INT     014004
        LIMIT   000002
        MAKEST  011650
        MSG     013474
        NORM    013554
        NUMOUT  013746
        NUMSGN  013760
        OPRATO  011272
        POL     000004
        POSIZE  000006
        RND1    000064
        RND2    000066
        SAVCHA  011650
        SOPRAT  011650
        START   001034
        STOVAR  017244
        STPRO   011650
        TABLE5  010756
        TBL5EN  011002
        TKS     177560
        TPB     177566
        T1      000056
        T2      000060
        T3      000062
        VAL     020702
        SSTKSZ  000200
        ,COMMA  000243
        ,EOL    000201
        ,LPAR   000255
        ,RPAR   000237
<       >       000000  021426
**********
MODULE  FPMP11
```

526

527

```
SECTION ENTRY   ADDRESS SIZE
<      >        021426  004276
        AINT    022544
        ALOG    022170
        ATAN    025040
        COS     024464
        ERRFPU  021430
        EXP     023314
        IFPMP   021426
        SIN     024520
        SQRT    025530
        $ADR    021434
        $OVR    022662
        $ERR    025666
        $ERRA   025676
        $ERVEC  025716
        $INTR   022562
        $IR     023664
        $MLR    023750
        $POLSH  025524
        $POPR3  024334
        $POPR4  024322
        $POPR5  024322
        $RI     024342
        $SBR    021430
        $V20A   025524
**********
MODULE  BASICH
SECTION ENTRY   ADDRESS SIZE
<      >        025724  003544
        USRARE  025724

 RUN-TIME:  5 SECONDS
 2K CORE USED
```

```
LNKX11   V021   22-MAR-73   16:21

#BASICS,STRMAP;DRK<BASICL,FPMP,BASICH/B:0/E

LOAD MAP

TRANSFER ADDRESS: 032706
LOW LIMIT: 000000
HIGH LIMIT: 034226
**********
MODULE  BASICL
SECTION ENTRY   ADDRESS SIZE
<. ABS.>        000000  000000
        ARGB    010276
        ARRAYS  000010
        COLUMN  000034
        ERRARG  010326
        ERRMIX  013026
        ERRPOL  011776
        ERRSYN  012554
        EVAL    011402
        FAC1    000040
        FAC2    000042
        FILLCO  000104
        GETVAR  015410
        INT     015620
        LIMIT   000002
        MAKEST  017264
        MSG     017530
        NORM    017610
        NUMOUT  020002
        NUMSGN  020014
        OPRATO  012176
        POL     000004
        POSIZE  000006
        RND1    000064
        RND2    000066
        SAVCHA  020646
        SOPRAT  012730
        START   001102
        STOVAR  021332
        STPRO   013176
        TABLE5  011562
        TBL5EN  011626
        TKS     177560
        TPB     177566
        T1      000056
        T2      000060
        T3      000062
        VAL     023440
        $STKSZ  000200
        .COMMA  000243
        .EOL    000201
        .LPAR   000255
        .RPAR   000237
<      >        000000  024164
**********
MODULE  FPMP11
```

528

534

```
SECTION ENTRY   ADDRESS SIZE
<     >         024164  004270
        AINT    025302
        ALOG    024720
        ATAN    027570
        COS     027222
        ERRFPU  024166
        EXP     026052
        IFPMP   024164
        SIN     027256
        SQRT    030206
        $AOR    024172
        $OVR    025420
        $ERR    030424
        $ERRA   030434
        $ERVEC  030454
        $INTR   025320
        $IR     026422
        $MLR    026506
        $POLSH  030202
        $POPR3  027072
        $POPR4  027066
        $POPR5  027060
        $RI     027100
        $$BR    024166
        $V20A   030202
**********
MODULE  BASICH
SECTION ENTRY   ADDRESS SIZE
<     >         030402  003544
        USRARE  030402

 RUN-TIME:  5 SECONDS
 2K CORE USED
```

```
PERPAR -- PERIPHERAL SUPPORT PA RT-11 MACRO VM02-09   16-OCT-74 01:51:42 PAGE 1

1                ,TITLE PERPAR -- PERIPHERAL SUPPORT PACKAGE PARAMETER MODULE,
2                ;
3                ; DEC-11-L8PAA-A-LA     BASIC KERNEL V02-01
4                ;
5                ; COPYRIGHT (C) 1974
6                ;
7                ; DIGITAL EQUIPMENT CORPORATION
8                ; MAYNARD, MASSACHUSETTS 01754
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22               ; DEC ASSUMES NO RESPONSIBILITY FOR THE USE
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24               ; WHICH IS NOT SUPPLIED BY DEC,
25
26               ; THE CONDITIONALS CONTAINED IN THIS MODULE AFFECT THE ASSEMBLY
27               ; OF THE FUNCTION TABLE MODULE "FTBL,MAC",
28               ; TO OBTAIN THE DESIRED CONDITIONAL DEFINITION(S),
29               ; REMOVE (USING AN EDITOR) THE
30               ; SEMI-COLON APPEARING BEFORE THE CONDITIONAL,
31               ;$DISK=0                ;DEFINE FOR RT-11
32                       ,IFNDF $DISK
33      000000 $STRNG=0                  ;DO NOT DEFINE FOR PTS BASIC WITHOUT
34                                       ;STRINGS,- DEFINED FOR PTS V01 WITH STRINGS
35                       ,ENDC           ;
36
37      000000 $LPS=0                    ;DEFINE FOR LPS
38                       ,IFDF $LPS
39               ;$V=0                   ;DEFINE FOR LPS WITH VECTORS STARTING
40               ;                       ;    AT 300,  DEFAULT SETTING IS VECTORS AT
41               ;                       ;    340, SET $V = ANY OTHER DISPLACEMENT IF
42               ;                       ;       VECTORS START AT DISPLACEMENTS
43               ;                       ;       OTHER THAN 0 OR 40 FROM
44               ;                       ;       VECTOR 300
45
46      000000 $ADC=0                    ;INCLUDE A/D ROUTINES,
47      000000 $CLK=0                    ;INCLUDE CLOCK ROUTINES,
48      000000 $DIO=0                    ;INCLUDE DIGITAL IO ROUTINES
49      000000 $DIS=0                    ;INCLUDE DISPLAY ROUTINES,
50                       ,ENDC   ;$LPS
51               ;
52               ;
53      000000 $VT11=0                   ;FOR GT40 (GT44)
54               ;
55               ;
56
57
```

```
                    .IFDF   $VT11
000000 $CLOCK=0                         ;FOR SYSTEM CLOCK (KW11L)
                    .ENDC

                    .EOT
                .TITLE PERVEC VECTOR DEFINITION MODULE FOR BASIC SUPPORT PACKAGES.
                ;
                ; DEC-11-LBPVA-A-LA     BASIC KERNEL V02-01
                ;
                ; COPYRIGHT (C) 1974
                ;
                ; DIGITAL EQUIPMENT CORPORATION
                ; MAYNARD, MASSACHUSETTS 01754
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```



```
                ; THIS MODULE DEFINES THE HARDWARE ADRESSES USED BY
                ; SUCH HARDWARE AS THE "LPS", THE "VT11"(GT40) AND THE "LV11".
                ; IF THE VECTORS FOR THESE DEVICES SHOULD CHANGE
                ; THIS MODULE MUST BE EDITED TO REFLECT THE CHANGE.

                    .IFDF $LPS
                    .IFNDF  $V
                    $V=40
                    .ENDC
                    .GLOBL LPSAD,LPSADB,LPSDR,LPSDMA
                    .GLOBL LPSCKS,LPSPB,LPSDRS,LPSDIB
                    .GLOBL LPSDOR
                    .GLOBL LPDISS,LPDISX,LPDISY
                    .GLOBL CKLIVA,CKLIP,DRSIVA,DRSIP,LPSIVA,LPSIP

                ; DEVICE EQUATES:

170400 LPSAD    =       170400  ;LPS A/D STATUS REG.
170402 LPSADB   =       170402  ;LPS A/D BUFFER LED REG.
170404 LPSCKS   =       170404  ;LPS CLOCK STATUS REG.
170406 LPSPB    =       170406  ;LPS CLOCK BUFFER PRESET REG.
170410 LPSDR    =       170410  ;LPS DIGITAL I/O STATUS REG.
170410 LPSDRS   =       LPSDR
170412 LPSDIB   =       170412  ;LPS DIGITAL INPUT REG.
170414 LPSDOR   =       170414  ;LPS DIGITAL OUTPUT REG.
170416 LPDISS   =       170416  ;LPS DISPLAY STATUS REG.
170420 LPDISX   =       170420  ;LPS DISPLAY REG. X
170422 LPDISY   =       170422  ;LPS DISPLAY REG. Y
170436 LPSDMA   =       170436  ;LPS DMA REGG.

                ; INTERRUPT VECTOR PAIRS:

000344 CKLIVA   =       304+$V  ;ADR. OF CLOCK INTERRUPT VECTOR
000346 CKLIP    =       306+$V  ;ADR. OF CLOCK INT.     PRIORITY

000350 DRSIVA   =       310+$V  ;ADR. OF DRS INT. VECTOR
000352 DRSIP    =       312+$V  ;ADR. OF DRS INT. PRIORITY.

000340 LPSIVA   =       300+$V  ;ADR. OF THE A/D INT. VECTOR.
000342 LPSIP    =       302+$V  ;ADR. OF THE INT.PRIORITY.

                    .ENDC   ;$LPS
                    .IFDF   $VT11   ;GT40
                    .GLOBL  DPC,DSR,DISX,DISY,GTVECT

172000 DPC      =       172000  ;VT11 DISPLAY PC
172002 DSR      =       DPC+2   ;VT11 DISPLAY STATUS REG
172004 DISX     =       DSR+2   ;VT11 X STATUS REG
172006 DISY     =       DISX+2  ;VT11 Y STATUS REG
000320 GTVECT   =       320     ;ADR. OF VT11 [GT40 (GT44)] INTERRUPT
                                ;VECTOR LIST. REDEFINING GTVECT
```

```
58                                      ;REDEFINES THE ENTIRE SET
59                                      ;OF DISPLAY PROCESSOR INT. VECTORS,
60              ;GTVECT:                ;DISPLAY STOP VECTOR
61              ;GTVECT+4:              ;LIGHT PEN HIT VECTOR
62              ;GTVECT+10:             ;DISPLAY TIME OUT VECTOR
63                      .ENDC   ;$VT11
64
65
66      000001'         .END
```


SYMBOL TABLE

```
CKLIP = 000346 G        CKLIVA= 000344 G        DISX  = 172004 G
DISY  = 172006 G        DPC   = 172000 G        DRSIP = 000352 G
DRSIVA= 000350 G        DSR   = 172002 G        GTVECT= 000320 G
LPDISS= 170416 G        LPDISX= 170420 G        LPDISY= 170422 G
LPSAD = 170400 G        LPSADB= 170402 G        LPSCKS= 170404 G
LPSDI8= 170412 G        LPSDMA= 170436 G        LPSDOR= 170414 G
LPSDR = 170410 G        LPSDRS= 170410 G        LPSIP = 000342 G
LPSIVA= 000340 G        LPSPB = 170406 G        $ADC  = 000000
$CLK  = 000000          $CLOCK= 000000          $DIO  = 000000
$DIS  = 000000          $LPS  = 000000          $STRNG= 000000
$V    = 000040          $VT11 = 000000
. ABS.  000000      000
        000000      001
ERRORS DETECTED: 0
FREE CORE: 18189. WORDS
```

```
PERVEC,GTL,LP:=PERPAR,GTL,PERVEC
```

```
                ;TITLE PERPAR -- PERIPHERAL SUPPORT PACKAGE PARAMETER MODULE.
                ;
                ; DEC-11-L8PAA-A-LA     BASIC KERNEL V02-01
                ;
                ; COPYRIGHT (C) 1974
                ;
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                ; THE CONDITIONALS CONTAINED IN THIS MODULE AFFECT THE ASSEMBLY
                ; OF THE FUNCTION TABLE MODULE "FTBL.MAC".
                ; TO OBTAIN THE DESIRED CONDITIONAL DEFINITION(S),
                ; REMOVE (USING AN EDITOR) THE
                ; SEMI-COLON APPEARING BEFORE THE CONDITIONAL.
                ;$DISK=0                ;DEFINE FOR RT-11
                        .IFNDF $DISK
        000000 $STRNG=0                 ;DO NOT DEFINE FOR PTS BASIC WITHOUT
                                        ;STRINGS,- DEFINED FOR PTS V01 WITH STRINGS
                        .ENDC           ;
                ;
        000000 $LPS=0                   ;DEFINE FOR LPS
                        .IFDF $LPS
                ;$V=0                   ;DEFINE FOR LPS WITH VECTORS STARTING
                ;                       ;     AT 300.  DEFAULT SETTING IS VECTORS AT
                ;                       ;     340. SET $V = ANY OTHER DISPLACEMENT IF
                ;                       ;        VECTORS START AT DISPLACEMENTS
                ;                       ;        OTHER THAN 0 OR 40 FROM
                ;                       ;        VECTOR 300
                ;
        000000 $ADC=0                   ;INCLUDE A/D ROUTINES.
        000000 $CLK=0                   ;INCLUDE CLOCK ROUTINES.
        000000 $DIO=0                   ;INCLUDE DIGITAL IO ROUTINES
        000000 $DIS=0                   ;INCLUDE DISPLAY ROUTINES.
                        .ENDC   ;$LPS
                ;
                ;
        000000 $VT11=0                  ;FOR GT40 (GT44)
                ;
                ;
```

3


```
                        .IFDF   $VT11
        000000 $CLOCK=0                 ;FOR SYSTEM CLOCK (KW11L)
                        .ENDC

                        .EOT
                ;TITLE PTSINT -- PTS INTERFACE MODULE FOR SUPPORT PACKAGES.
                ;
                ; DEC-11-L8PIA-A-LA     BASIC KERNEL V02-01
                ;
                ; COPYRIGHT (C) 1974
                ;
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                ; WHICH IS NOT SUPPLIED BY DEC.
                ;
                        .GLOBL FTBL,BOMB
        000000          .ASECT
        000034 .=34
                        .IFNDF $DISK            ;BOMB VARIES IF ONE INCLUDES
                        .IFDF  $STRNG           ;STRINGS
        010320 BOMB=010320                      ;ENTRY WITH STRINGS
                        .ENDC                   ;$STRNG IS DEFINED
                        .IFNDF $STRNG           ;NO STRINGS
                BOMB=007742                     ;ENTRY WITHOUT STRINGS
                        .ENDC                   ;$STRNG NOT DEFINED
                        .ENDC                   ;$DISK
 0034 010320            .WORD   BOMB,0          ;SET UP THE TRAP ERROR VECTOR.
 0036 000000
        000040          .ASECT
        000046 .=46
 0046 000000G           .WORD   FTBL            ;THE FUNCTION TABLE STARTS HERE FOR PTS.
                        .IFDF $LPS
                        .IFDF $DIS
                        .GLOBL DISPLY
 0050 000167            JMP DISPLY
        000000G
                        .ENDC   ;$DIS
                        .ENDC   ;$LPS
        000001'         .END
```

```
PTSINT -- PTS INTERFACE MODULE  RT-11 MACRO VM02-09   16-OCT-74 01:52:29 PAGE 1+
SYMBOL TABLE

$OMB   = 010320 G        DISPLY= ****** G        FTBL  = ****** G
$ADC   = 000000          $CLK  = 000000          $CLOCK= 000000
$DIO   = 000000          $DIS  = 000000          $LPS  = 000000
$STRNG= 000000           $VT11 = 000000
. ABS.  000054     000
        000000     001
ERRORS DETECTED: 0
FREE CORE: 18268. WORDS

PTSINT,GTL,LP:=PERPAR,GTL,PTSINT
```

```
PERPAR -- PERIPHERAL SUPPORT PA RT-11 MACRO VM02-09   16-OCT-74 01:53:02 PAGE 1

1                .TITLE PERPAR -- PERIPHERAL SUPPORT PACKAGE PARAMETER MODULE.
2                ;
3                ; DEC-11-LBPAA-A-LA     BASIC KERNEL V02-01
4                ;
5                ; COPYRIGHT (C) 1974
6                ;
7                ; DIGITAL EQUIPMENT CORPORATION
8                ; MAYNARD, MASSACHUSETTS 01754
9                ;
10               ; THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO
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22               ; DEC ASSUMES NO RESPONSIBILITY FOR THE USE
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24               ; WHICH IS NOT SUPPLIED BY DEC.
25
26               ; THE CONDITIONALS CONTAINED IN THIS MODULE AFFECT THE ASSEMBLY
27               ; OF THE FUNCTION TABLE MODULE "FTBL,MAC".
28               ; TO OBTAIN THE DESIRED CONDITIONAL DEFINITION(S),
29               ; REMOVE (USING AN EDITOR) THE
30               ; SEMI-COLON APPEARING BEFORE THE CONDITIONAL.
31               ;$DISK=0                ;DEFINE FOR RT-11
32                       .IFNDF $DISK
33      000000 $STRNG=0                  ;DO NOT DEFINE FOR PTS BASIC WITHOUT
34                                       ;STRINGS,- DEFINED FOR PTS V01 WITH STRINGS
35                       .ENDC           ;
36
37      000000 $LPS=0                    ;DEFINE FOR LPS
38                       .IFDF $LPS
39               ;$V=0                   ;DEFINE FOR LPS WITH VECTORS STARTING
40               ;                       ;     AT 300,  DEFAULT SETTING IS VECTORS AT
41               ;                       ;     340, SET $V = ANY OTHER DISPLACEMENT IF
42               ;                       ;        VECTORS START AT DISPLACEMENTS
43               ;                       ;        OTHER THAN 0 OR 40 FROM
44               ;                       ;        VECTOR 300
45
46      000000 $ADC=0                    ;INCLUDE A/D ROUTINES,
47      000000 $CLK=0                    ;INCLUDE CLOCK ROUTINES,
48      000000 $DIO=0                    ;INCLUDE DIGITAL IO ROUTINES
49      000000 $DIS=0                    ;INCLUDE DISPLAY ROUTINES,
50                       .ENDC   ;$LPS
51               ;
52               ;
53      000000 $VT11=0                   ;FOR GT40 (GT44)
54               ;
55               ;
56
57
```

```
                        .IFDF   $VT11
000000 $CLOCK=0                                 ;FOR SYSTEM CLOCK (KW11L)
                        .ENDC

                        .EOT
                .TITLE  FTBL--BASIC FUNCTION TABLE MODULE

                ;       DEC-11-LBFTA-A-LA       BASIC KERNEL V02-01
                ;
                ; COPYRIGHT (C) 1973,1974
                ;
                ; DIGITAL EQUIPMENT CORPORATION
                ; MAYNARD, MASSACHUSETTS 01754
                ;
                ; THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO
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                ;
                ; DEC ASSUMES NO RESPONSIBILITY FOR THE USE
                ; OR RELIABILITY OF ITS SOFTWARE ON EQUIPMENT
                ; WHICH IS NOT SUPPLIED BY DEC.


                        .GLOBL FTBL

                ;       MUST INTERFACE PROPERLY WHEN LPS IS ALSO USED
                ;


       000000'          .CSECT
00000           FTBL:
                        .IFDF $VT11     ;GT40
                        .GLOBL  AGET,APNT,APUT,CONT,ERAS,ESUB,FPUT
                        .GLOBL  FIGR,FPUT,INIT,LPEN,RDOT
                        .GLOBL  SCAL,STAT,DSTP,SUBP,TEXT,TRAK
                        .GLOBL  VECT,XGRA,YGRA,FIX,FREE
                        .GLOBL  NOSC,ON,OFF,SAVE
                        .IFDF   $DISK
                        .GLOBL  RSTR
                        .ENDC   ;$DISK
                        .IFDF   $CLOCK
                        .GLOBL  TIME,TIMR
                        .ENDC   ;$CLOCK

0000    123             .ASCII  /SCAL/
0001    103
0002    101
0003    114
0004 000000G            .WORD    SCAL
```



```
0006    126             .ASCII  /VECT/
0007    105
0010    103
0011    124
0012 000000G            .WORD    VECT
0014    122             .ASCII  /RDOT/
0015    104
0016    117
0017    124
0020 000000G            .WORD    RDOT
0022    101             .ASCII  /APNT/
0023    120
0024    116
0025    124
0026 000000G            .WORD    APNT
                        .IFDF   $CLOCK
0030    124             .ASCII  /TIME/
0031    111
0032    115
0033    105
0034 000000G            .WORD   TIME
0036    124             .ASCII  /TIMR/
0037    111
0040    115
0041    122
0042 000000G            .WORD    TIMR
                        .ENDC   ;$CLOCK
0044    123             .ASCII  /STAT/
0045    124
0046    101
0047    124
0050 000000G            .WORD    STAT
0052    124             .ASCII  /TEXT/
0053    105
0054    130
0055    124
0056 000000G            .WORD    TEXT
0060    123             .ASCII  /SUBP/
0061    125
0062    102
0063    120
0064 000000G            .WORD    SUBP
0066    105             .ASCII  /ESUB/
0067    123
0070    125
0071    102
0072 000000G            .WORD    ESUB
0074    114             .ASCII  /LPEN/
0075    120
0076    105
0077    116
0100 000000G            .WORD    LPEN
0102    116             .ASCII  /NOSC/
0103    117
0104    123
0105    103
0106 000000G            .WORD    NOSC
```

```
137 0110    104         .ASCII  /DON/
    0111    117
    0112    116
138 0113    000         .BYTE   0
139 0114 000000G        .WORD    ON
140 0116    117         .ASCII  /ON/
    0117    116
141 0120 000000         .WORD   0
142 0122 000000G        .WORD   ON      ; SECOND NAME
143 0124    117         .ASCII  /OFF/
    0125    106
    0126    106
144 0127    000         .BYTE   0
145 0130 000000G        .WORD    OFF
146 0132    124         .ASCII  /TRAK/
    0133    122
    0134    101
    0135    113
147 0136 000000G        .WORD    TRAK
148 0140    105         .ASCII  /ERAS/
    0141    122
    0142    101
    0143    123
149 0144 000000G        .WORD    ERAS
150 0146    111         .ASCII  /INIT/
    0147    116
    0150    111
    0151    124
151 0152 000000G        .WORD    INIT
152 0154    104         .ASCII  /DSTP/
    0155    123
    0156    124
    0157    120
153 0160 000000G        .WORD    DSTP
154 0162    123         .ASCII  /STOP/  ;SECOND NAME
    0163    124
    0164    117
    0165    120
155 0166 000000G        .WORD   DSTP
156 0170    104         .ASCII  /DCNT/
    0171    103
    0172    116
    0173    124
157 0174 000000G        .WORD    CONT
158 0176    103         .ASCII  /CONT/  ;SECOND NAME
    0177    117
    0200    116
    0201    124
159 0202 000000G        .WORD   CONT
160 0204    130         .ASCII  /XGRA/
    0205    107
    0206    122
    0207    101
161 0210 000000G        .WORD    XGRA
162 0212    131         .ASCII  /YGRA/
    0213    107
    0214    122
```



```
    0215    101
163 0216 000000G        .WORD    YGRA
164 0220    101         .ASCII  /AGET/
    0221    107
    0222    105
    0223    124
165 0224 000000G        .WORD    AGET
166 0226    104         .ASCII  /DFIX/
    0227    106
    0230    111
    0231    130
167 0232 000000G        .WORD   FIX
168 0234    106         .ASCII  /FIX/   ;SECOND NAME
    0235    111
    0236    130
169 0237    000         .BYTE   0
170 0240 000000G        .WORD    FIX
171 0242    106         .ASCII  /FREE/
    0243    122
    0244    105
    0245    105
172 0246 000000G        .WORD    FREE
173 0250    101         .ASCII  /APUT/
    0251    120
    0252    125
    0253    124
174 0254 000000G        .WORD    APUT
175 0256    106         .ASCII  /FIGR/
    0257    111
    0260    107
    0261    122
176 0262 000000G        .WORD    FIGR
177 0264    106         .ASCII  /FPUT/
    0265    120
    0266    125
    0267    124
178 0270 000000G        .WORD    FPUT
179 0272    104         .ASCII  /DSAV/
    0273    123
    0274    101
    0275    126
180 0276 000000G        .WORD    SAVE
181 0300    123         .ASCII  /SAVE/  ;SECOND NAME
    0301    101
    0302    126
    0303    105
182 0304 000000G        .WORD   SAVE
183                     .IFDF   $DISK
184                     .ASCII  /RSTR/
185                     .WORD    RSTR
186                     .ENDC   ;$DISK
187                     .ENDC   ;$VT11
188
189
190
191
192                     .IFDF $LPS
```

```
193
194                     .GLOBL USE,RDB,ACC
195                     ;
196                             .IFDF $ADC
197                             .GLOBL ADC,RTS,LED
198                             .ENDC   ;$ADC
199                     ;
200                             .IFDF $CLK
201                             .GLOBL SETR,SETC,HIST,WAIT
202                             .ENDC   ;$CLK
203                     ;
204                             .IFDF $DIO
205                             .GLOBL DIR,DOR,DRS
206                             .GLOBL REL
207                             .ENDC ;$DIO
208                     ;
209                             .IFDF $DIS
210                             .GLOBL CLRD,PUTD,DIS,FSH,DXY,DISPLY
211                             .ENDC ;$DIS
212
213
214
215 0306    125           .ASCII  /USE/
    0307    123
    0310    105
216 0311    000           .BYTE   0
217 0312 000000G          .WORD   USE
218                     ;
219 0314    122           .ASCII  /RDB/
    0315    104
    0316    102
220 0317    000           .BYTE   0
221 0320 000000G          .WORD   RDB
222                     ;
223 0322    101           .ASCII  /ACC/
    0323    103
    0324    103
224 0325    000           .BYTE   0
225 0326 000000G          .WORD   ACC
226                     ;
227                     ;
228                     ;
229                             .IFDF   $ADC
230                     ;
231 0330    101           .ASCII  /ADC/
    0331    104
    0332    103
232 0333    000           .BYTE   0
233 0334 000000G          .WORD   ADC
234                     ;
235 0336    122           .ASCII  /RTS/
    0337    124
    0340    123
236 0341    000           .BYTE   0
237 0342 000000G          .WORD   RTS
238                     ;
239 0344    114           .ASCII  /LED/
```



```
    0345    105
    0346    104
240 0347    000           .BYTE   0
241 0350 000000G          .WORD   LED
242                     ;
243                             .ENDC   ;$ADC
244                     ;
245                     ;
246                     ;
247                             .IFDF $CLK
248                     ;
249 0352    123           .ASCII  /SETR/
    0353    105
    0354    124
    0355    122
250 0356 000000G          .WORD   SETR
251                     ;
252 0360    123           .ASCII  /SETC/
    0361    105
    0362    124
    0363    103
253 0364 000000G          .WORD   SETC
254                     ;
255 0366    110           .ASCII  /HIST/
    0367    111
    0370    123
    0371    124
256 0372 000000G          .WORD   HIST
257                     ;
258 0374    127           .ASCII  /WAIT/
    0375    101
    0376    111
    0377    124
259 0400 000000G          .WORD   WAIT
260                     ;
261                             .ENDC ;$CLK
262                     ;
263                     ;
264                     ;
265                             .IFDF   $DIO
266                     ;
267 0402    104           .ASCII  /DIR/
    0403    111
    0404    122
268 0405    000           .BYTE   0
269 0406 000000G          .WORD   DIR
270                     ;
271 0410    104           .ASCII  /DOR/
    0411    117
    0412    122
272 0413    000           .BYTE   0
273 0414 000000G          .WORD   DOR
274                     ;
275 0416    104           .ASCII  /DRS/
    0417    122
    0420    123
276 0421    000           .BYTE   0
```

```
277 0422 000000G        .WORD   DRS
278                     )
279 0424     122        .ASCII  /REL/
    0425     105
    0426     114
280 0427     000        .BYTE   0
281 0430 000000G        .WORD   REL
282                     )
283                     .ENDC   ;$DIO
284                     )
285                     )
286                     )
287                     .IFDF   $DIS
288                     )
289 0432     103        .ASCII  /CLRD/
    0433     114
    0434     122
    0435     104
290 0436 000000G        .WORD   CLRD
291                     )
292 0440     120        .ASCII  /PUTD/
    0441     125
    0442     124
    0443     104
293 0444 000000G        .WORD   PUTD
294                     )
295 0446     104        .ASCII  /DIS/
    0447     111
    0450     123
296 0451     000        .BYTE   0
297 0452 000000G        .WORD   DIS
298                     )
299 0454     106        .ASCII  /FSH/
    0455     123
    0456     110
300 0457     000        .BYTE   0
301 0460 000000G        .WORD   FSH
302                     )
303 0462     104        .ASCII  /DXY/
    0463     130
    0464     131
304 0465     000        .BYTE   0
305 0466 000000G        .WORD   DXY
306                     )
307                     .ENDC   ;$DIS
308                     .ENDC   ;$LPS
309 0470 000000         .WORD   0       ;END OF THE BASIC FUNCTION TABLE.
310      000001'        .END
```


SYMBOL TABLE

```
ACC    = ****** G        ADC    = ****** G        AGET   = ****** G
APNT   = ****** G        APUT   = ****** G        CLRD   = ****** G
CONT   = ****** G        DIR    = ****** G        DIS    = ****** G
DISPLY= ****** G         DOR    = ****** G        DRS    = ****** G
DSTP   = ****** G        DXY    = ****** G        ERAS   = ****** G
ESUB   = ****** G        FIGR   = ****** G        FIX    = ****** G
FPUT   = ****** G        FREE   = ****** G        FSH    = ****** G
FTBL     000000RG        HIST   = ****** G        INIT   = ****** G
LED    = ****** G        LPEN   = ****** G        NOSC   = ****** G
OFF    = ****** G        ON     = ****** G        PUTD   = ****** G
RDB    = ****** G        RDOT   = ****** G        REL    = ****** G
RTS    = ****** G        SAVE   = ****** G        SCAL   = ****** G
SETC   = ****** G        SETR   = ****** G        STAT   = ****** G
SUBP   = ****** G        TEXT   = ****** G        TIME   = ****** G
TIMR   = ****** G        TRAK   = ****** G        USE    = ****** G
VECT   = ****** G        WAIT   = ****** G        XGRA   = ****** G
YGRA   = ****** G        $ADC   = 000000          $CLK   = 000000
$CLOCK= 000000           $DIO   = 000000          $DIS   = 000000
$LPS   = 000000          $STRNG= 000000           $VT11  = 000000

. ABS.  000000     000
        000472     001
ERRORS DETECTED: 0
FREE CORE: 18081. WORDS

FTBL.GTL,LP:=PERPAR.GTL,FTBL
```

```
1               .TITLE  LPS0  V01-01
2               ;.SBTTL LPS MAIN KERNEL MODULE #0
3               ;
4               ; DEC-11-LBEXA-B-LA1    BASIC KERNEL V02-01
5               ;
6               ; COPYRIGHT (C) 1973,1974
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25              ; WHICH IS NOT SUPPLIED BY DEC.
26              ;
27              ; WRITTEN BY:  RICK HULLY        FEB,, 1973
28              ;
```



```
1               ;
2               ; THE FOLLOWING COMMON SUPPORT ROUTINES EXIST IN THIS MODULE:
3               ;
4               ;       POLENT - ENTER POISH MODE OPERATION
5               ;       CKCMGN - POLISH ROUTINE TO CHECK NEXT TOKEN EQEAL TO
6               ;                ,COMMA AND THEN FETCH THE NEXT FLOATING
7               ;                POINT NUMERIC FROM THE INPUT STRING.
8               ;       GETNUM - POLISH ROUTINE TO FETCH A FLOATING POINT
9               ;                NUMERIC FROM INPUT STRING.
10              ;       SAVREG - POLISH ROUTINE TO SAVE R0, R2 AND R3
11              ;                ON THE STACK.
12              ;       SAVFAC - POLISH ROUTINE TO SAVE THE FAC ON THE
13              ;                STACK.
14              ;       SAVINT - POLISH ROUTINE TO SAVE ONLY THE INTEGER
15              ;                PORTION OF THE FAC ON THE STACK.
16              ;       RESREG - POLISH ROUTINE TO RESTORE R3, R2 AND
17              ;                R0 FROM THE STACK.
18              ;       INTST  - POLISH ROUTINE TO INTEGERIZE FAC AND CHECK
19              ;                ITS RANGE AGAINST A GIVEN VALUE.
20              ;       FLOAT  - ROUTINE TO FLOAT A 16 BIT UNSIGNED INTEGER
21              ;       ENTERP - ROUTINE TO ENTER POLISH MODE FOR ONE ROUTINE
22              ;                ONLY AND THEN EXIT BACK TO CALLER.
23              ;       BUFRES - POLISH ROUTINE TO RESET BUFFER POINTERS TO A
24              ;                CIRCULAR BUFFER.
25              ;       GETV   - POLISH ROUTINE TO CALCULATE ADDRESS OF
26              ;                VARIABLE SPECIFIED IN THE INPUT LINE.
27              ;       GETBUF - POLISH ROUTINE TO FETCH NEXT VARIABLE FROM
28              ;                INPUT LINE, TEST FOR AN ARRAY NAME AND
29              ;                CALCULATE THE POSITION IN THE ARRAY FROM
30              ;                SUBSCRIPTS WHICH MAY BE GIVEN.
31              ;       CKBUF  - POLISH ROUTINE TO CHECK IF ARRAY ADDRESS
32              ;                SPECIFIED IN VARSAV(R5) HAS BEEN DEFINED BY
33              ;                A "USE" COMMAND.
34              ;       GETDAT - ROUTINE TO FETCH DATA INTO USER'S BUFFER
35              ;                AND TEST FOR NON-EXISTANT DATA.
36              ;       STODAT - ROUTINE TO STORE DATA INTO USER'S BUFFER
37              ;                AND TEST FOR DATA OVERRUN.
38              ;       GETADD - ROUTINE TO CALCULATE ARRAY ADDRESS FROM
39              ;                ARRAY NAME GIVEN BY CALLER.
40              ;       CKLPAR - POLISH ROUTINE TO CHECK NEXT TOKEN
41              ;                EQUAL TO A LEFT PARENS.  A TEST
42              ;                IS THEN MADE TO INSURE THAT WE STILL HAVE
43              ;                ROOM LEFT TO WORK WITH.
44              ;       CKCOMA - POLISH ROUTINE TO CHECK NEXT TOKEN
45              ;                EQUAL TO A .COMMA.
46              ;       STORXT - COMMON EXIT ROUTINE TO STORE FAC IN VARIABLE
47              ;                SET UP IN VARSAV(R5), CHECK LAST TOKEN EQUAL
48              ;                TO A RIGHT PARENS (ALTERNATE ENTRY POINT -
49              ;                NAMED CKRPAR), AND RETURN TO THE BASIC
50              ;                INTERPRETER.
51              ;       CKRPAR - ROUTINE TO CHECK LAST TOKEN EQUAL TO A
52              ;                RIGHT PARENS AND RETURN TO THE BASIC
53              ;                INTERPRETER.
54              ;       CONBCD - ROUTINE TO CONVERT BCD TO BINARY
55              ;
```

```
                ;       .SBTTL  PROGRAM GLOBALS
                ;
                ; GLOBALS REQUIRED FOR COMMUNICATION WITH THE BASIC
                ; INTREPRETER.
                ;
                        .GLOBL  ERRPDL,ERRSYN,ERRARG
                        .GLOBL  EVAL,GETVAR,STOVAR
                        .GLOBL  INT,,COMMA,,RPAR
                        .GLOBL  NUMSGN,,LPAR
                ;
                ; GLOBALS REQUIRED FOR COMMUNICATIONS WITH THE VARIOUS
                ; LPS MODULES.
                ;
                        .GLOBL  TABLE,NARRAY,FLOAT
                        .GLOBL  POLENT,GETADD,GETNUM
                        .GLOBL  CKCMGN,INTST,GETV
                        .GLOBL  GETBUF,REGSAV,ERNOR
                        .GLOBL  STORXT,CKRPAR,ERBUF
                        .GLOBL  CKCOMA,ENTERP,STODAT
                        .GLOBL  GETDAT,RTSON,DRSON
                        .GLOBL  SAVER2,SAVFAC,RESTR2
                        .GLOBL  RESTOR,HISTON,BCDON
                        .GLOBL  CONBCD,BUFRES,DRSNPT
                        .GLOBL  SAVINT,DRSBUF
                ;
                ; GLOBALS REQUIRED FOR COMMAND PROCESSORS
                ;
                        .GLOBL  USE,RDB,ACC
                ;
                ; GLOBALS FOR DEVICE ADDRESSES
                ;
                        .GLOBL  LPSAD,LPSDR
                ;
```



```
                ;       .SBTTL  REGISTER ASSIGNMENTS AND EQUATES
                ;
        000000 R0       =       %0
        000001 R1       =       %1
        000002 R2       =       %2
        000003 R3       =       %3
        000004 R4       =       %4
        000005 R5       =       %5
        000006 SP       =       %6
        000007 PC       =       %7
                ;
                ; GENERAL EQUATES
                ;
        177776 PS       =       -2              ;PS = PROCESSOR STATUS WORD
        000207 RETURN   =       207             ;207 = RTS PC
        000134 POLRET   =       134             ;134 = JMP @(R4)+
                ;
                ; BASIC USER'S EQUATES
                ;
        000022 VARSAV   =       22              ;VAR SAVE FOR ASSIGNMENT
        000024 SS1SAV   =       24              ;SS1 SAVE FOR ASSIGNMENT
        000026 SS2SAV   =       26              ;SS2 SAVE FOR ASSIGNMENT
        000040 FAC1     =       40              ;HIGH ORDER FLOATING VALUE
        000042 FAC2     =       42              ;LOW  ORDER FLOATING VALUE
        000062 T3       =       62              ;SHORT TERM TEMPORARY
                ;
                ; BUFFER DESCRIPTOR EQUATES
                ;
        000000 BEG      =       0               ;OFFSET TO BEGINNING OF BUFFER OINTER
        000002 END      =       2               ;OFFSET TO END OF BUFFER POINTER
        000004 PUT      =       4               ;OFFSET TO PUT DATA POINTER
        000006 GET      =       6               ;OFFSET TO GET DATA POINTER
        000010 BAD      =       10              ;OFFSET TO BAD DATA FLAG
        000012 DEL      =       12              ;OFFSET TO DISPLAY DELTA X
                ;
                ; BUFFER DESCRIPTOR TABLE
                ;
        000005 NARRAY=5                         ;CURRENT NUMBER OF ARRAY ENTRIES
                ;                               ;     SET AT 5.
 00000 000000 TABLE:: .WORD   0,0,0,0,0,0       ;6 WORDS PER ENTRY
 00002 000000
 00004 000000
 00006 000000
 00010 000000
 00012 000000
 00014 000000         .WORD   0,0,0,0,0,0
 00016 000000
 00020 000000
 00022 000000
 00024 000000
 00026 000000
 00030 000000         .WORD   0,0,0,0,0,0
 00032 000000
 00034 000000
 00036 000000
 00040 000000
 00042 000000
```

```
 43 00044 000000          .WORD   0,0,0,0,0,0
    00046 000000
    00050 000000
    00052 000000
    00054 000000
    00056 000000
 44 00060 000000          .WORD   0,0,0,0,0,0
    00062 000000
    00064 000000
    00066 000000
    00070 000000
    00072 000000
 45                       ;
 46                       ; NON-REENTRANT VARIABLES
 47                       ;
 48 00074     000 RTSON:  .BYTE   0               ;RTS OPERATION IN PROGRESS
 49 00075     000 DRSON:  .BYTE   0               ;DRS OPERATION IN PROGRESS
 50 00076     000 HISTON: .BYTE   0               ;HIST OPERATION IN PROGRESS
 51 00077     000 BCDON:  .BYTE   0               ;BCD/BINARY SWITCH
 52 00100 000000 DRSBUF: .WORD   0               ;DRS COMMAND (BUFFER DESCRIPTOR
 53                                               ;     ADDRESS)
 54 00102 000000 DRSNPT: .WORD   0               ;DRS COMMAND (NBR OF POINTS)
 55                       ;
```



```
  1                       ;       .SBTTL  "USE" COMMAND PROCESSOR
  2                       ;
  3                       ;**************************************************************
  4                       ;
  5                       ; "USE" COMMAND PROCESSOR
  6                       ;
  7                       ; BASIC FORM:   CALL "USE"(BUF[,BUF2[,....[,BUFN]]])
  8                       ;
  9                       ; PURPOSE:  DEFINE BUFFER AREAS FOR USE WITH THE RTS, HIST,
 10                       ;               DRS, RDB, CLRD, PUTD, DIS, FSH, AND DXY
 11                       ;               COMMANDS.  THIS COMMAND DEFINES THE SPECIFIED
 12                       ;               ARRAYS, BUF1, BUF2, ETC.,... AS CIRCULAR
 13                       ;               DATA ARRAYS.  ANY NUMBER OF BUFFERS MAY BE
 14                       ;               SPECIFIED, BUT ALL MUST BE GIVEN IN A SINGLE
 15                       ;               "USE" STATEMENT.  CURRENTLY THE SYSTEM WILL
 16                       ;               SUPPORT UP TO 5 OF THESE AREAS, HOWEVER, THIS
 17                       ;               MAY BE CHANGED AT ANY TIME BY REASSEMBLY.  EACH
 18                       ;               BUF DEFINED MUST HAVE PREVIOUSLY BEEN DEFINED
 19                       ;               IN A "DIM" STATEMENT.  THE FOLLOWING FORM, HOWEVER,
 20                       ;               IS LEGAL:
 21                       ;                       10 DIM A(50),B(100),C(200)
 22                       ;                       20 CALL "USE"(A,A(25),B,C)
 23                       ;
 24 00104                 USE:                           ;ENTRY POINT TO PROCESSOR
 25 00104 004767          JSR     PC,POLENT              ;ENTRY POLISH MODE AND CHECK
          001214
 26                                                      ;     FOR ENOUGH AREA TO WORK
 27                                                      ;     WITH AND THAT FIRST TOKEN
 28                                                      ;     IS INDEED A LEFT PARENS,
 29 00110 000112'         ,+2                            ;EXIT POLISH MODE
 30 00112 012746          MOV     #NARRAY,-(SP)          ;#NARRAY'S ALLOWED,
          000005
 31 00116 012746          MOV     #TABLE,-(SP)           ;WHERE DEFINITIONS WILL END UP
          000000'
 32 00122 004767 USE3:    JSR     PC,GETADD              ;GET ARRAY FROM INPUT LINE AND
          001070
 33                                                      ;     CALCULATE ITS ARRAY ADDRESS,
 34                                                      ;     THEN CHECK TO MAKE SURE ITS
 35                                                      ;     WITHIN RANGE.
 36 00126 011602 USE2:    MOV     (SP),R2                ;GET TABLE ADDRESS
 37 00130 016522          MOV     VARSAV(R5),(R2)+       ;SAVE BEGINNING ADDRESS OF
          000022
 38                                                      ;     ARRAY IN TABLE
 39 00134 010322          MOV     R3,(R2)+               ;SAVE ENDING ADDRESS OF ARRAY
 40                                                      ;     IN TABLE.
 41 00136 016522          MOV     VARSAV(R5),(R2)+       ;RESET GET AND PUT POINTERS
          000022
 42 00142 016522          MOV     VARSAV(R5),(R2)+
          000022
 43 00146 005022          CLR     (R2)+                  ;CLEAR BAD DATA FLAG
 44 00150 005022          CLR     (R2)+                  ;CLEAR DELTA X INCREMENT
 45 00152 010216          MOV     R2,(SP)                ;SAVE CURRENT TABLE POSITION
 46 00154 005762          TST     -12(R2)                ;WERE WE ZEROING THE REST OF
          177766
 47                                                      ;     THE ARRAY?
 48 00160 001420          BEQ     USE4                   ;YES:  CONTINUE ZEROING THEN
 49 00162 022702          CMP     #TABLE+14,R2           ;CHECK IF PREVIOUSLY DEFINED ARRAY
```

```
          000014'
50 00166 001415           BEQ     USE4            ;    WAS FROM SAME DIMENSIONED
51                                                ;    ARRAY,  1ST ENTRY IS NOT
52                                                ;    CHECKED.
53 00170 026262           CMP     -26(R2),-12(R2)
          177752
          177766
54 00176 001011           BNE     USE4            ;ARRAYS NOT SAME,  CHECK IF THE
55 00200 026262           CMP     -30(R2),-14(R2) ;    LARGER ONE IS THE PREVIOUS
          177750
          177764
56                                                ;    ONE.
57 00206 101005           BHI     USE4            ;YES:  FORGET IT THEN,  USER MUST
58                                                ;    WANT TO OVERAY HIS DATA AREAS.
59 00210 016203           MOV     -14(R2),R3      ;DEFINE PREVIOUS ARRAY'S END ADDRESS
          177764
60 00214 005743           TST     -(R3)           ;    TO BE 2 LESS THAN THE START
61 00216 010362           MOV     R3,-26(R2)      ;    OF THE NEW ARRAY.
          177752
62 00222 005366 USE4:     DEC     2(SP)           ;ANY MORE SPACE AVAILABLE?
          000002
63 00226 003003           BGT     USE1            ;YES:  CHECK NEXT TOKEN FOR A
64                                                ;    ,COMMA OR RIGHT PARENS.
65 00230 022626           CMP     (SP)+,(SP)+     ;CLEAN UP STACK
66 00232 000167           JMP     CKRPAR          ;ALL DONE, CHECK FOR RIGHT
          001130
67                                                ;    PARENS AND RETURN TO
68                                                ;    THE BASIC INTREPRETER.
69 00236 122127 USE1:     CMPB    (R1)+,#,COMMA   ;NEXT TOKEN A ,COMMA?
          000000G
70 00242 001727           BEQ     USE3            ;YES:  GET NEXT ARRAY NAME
71 00244 005301           DEC     R1              ;BACK UP TO UNCLASSIFIED TOKEN
72 00246 005003           CLR     R3              ;CLEAR REST OF TABLE
73 00250 005065           CLR     VARSAV(R5)
          000022
74 00254 000724           BR      USE2
75                )
```



```
1                 ;       .SBTTL  "RDB" COMMAND PROCESSOR
2                 ;
3                 ;**********************************************************************
4                 ;
5                 ; "RDB" COMMAND PROCESSOR
6                 ;
7                 ; BASIC FORM:   CALL "RDB"(BUF,VAR)
8                 ;
9                 ; PURPOSE:  RETURN THE NEXT DATA POINT FROM THE SPECIFIED
10                ;               BUFFER,  RETURNS VALUES OF 65535 >= VAR >= 0
11                ;               FOR GOOD DATA,  BAD DATA (DEFINED AS OVERRUN)
12                ;               IS RETURNED AS OUTSIDE THE SPECIFIED RANGE
13                ;               (VIZ., NEG. FLOATING POINT MINUS ONE),  IF NO
14                ;               DATA EXISTS YET, I.E., IT'S WAITING FOR A NEW
15                ;               SAMPLE, A FLOATING POINT MINUS TWO WILL BE
16                ;               RETURNED.
17                ;
18                ;               WHEN THE REFERENCED BUFFER REFERS TO
19                ;               ANALOG SAMPLING (RTS FUNCTION), THE VALUES
20                ;               RETURNED ARE IN THE RANGE 4095 >= VAR >= 0.
21                ;
22                ;               WHEN THE REFERENCED BUFFER REFERS TO A CLOCKED
23                ;               HISTOGRAM SAMPLING (HIST FUNCTION), THE VALUES
24                ;               RETURNED ARE IN THE RANGE 65535 >= VAR >= 0.
25                ;               THESE VALUES ARE EITHER THE NUMBER OF TICKS
26                ;               ACCUMULATED OR THE NUMBER REMAINING DEPENDING
27                ;               ON THE CURRENT CLOCK MODE.
28                ;
29                ;               WHEN THE REFERENCED BUFFER REFERS TO A DIGITAL
30                ;               I/O OPERATION (DRS FUNCTION), A VALUE BETWEEN
31                ;               65535 >= VAR >= 0 IS RETURNED FROM THE NEXT
32                ;               POSITION IN THE SPECIFIED BUFFER.
33                ;
34                ;               IN ALL CASES, A FLOATING POINT MINUS ONE
35                ;               IS RETURNED WHEN THE BUFFER IS OVERRUN.
36                ;
37 00256          RDB:                                ;ENTRY POINT TO PROCESSOR
38 00256 004767           JSR     PC,POLENT           ;ENTER POLISH MODE AND CHECK
          001442
39                                                    ;    FOR ENOUGH AREA TO WORK
40                                                    ;    WITH AND THAT FIRST TOKEN
41                                                    ;    IS INDEED A LEFT PARENS.
42 00262 000702'          +GETBUF                     ;GET BUFFER ADDRESS FROM COMMAND STRING
43                                                    ;    AND CHECK IT AGAINST THE
44                                                    ;    DEFINITION TABLE.
45 00264 000366'          +SAVER2                     ;SAVE DESCRIPTOR ADDRESS ON STACK
46 00266 001352'          +CKCOMA                     ;CHECK NEXT TOKEN EQUAL TO A COMMA
47 00270 000656'          +GETV                       ;GET VARIABLE ADDRESS.
48 00272 000274'          .+2                         ;EXIT POLISH MODE
49 00274 012602           MOV     (SP)+,R2            ;RESTORE DESCRIPTOR ADDRESS
50 00276 004767           JSR     PC,GETDAT           ;GET DATA FROM ARRAY SPECIFIED BY R2
          000454
51 00302 103402           BCS     RDB1                ;CS MEANS R3 IS RETURNING AN
52                                                    ;    ERROR CONDITION.
53 00304 004767           JSR     PC,FLOAT            ;FLOAT THE 16 BIT UNSIGNED INTEGER
          000234
54 00310 000167 RDB1:     JMP     STORXT              ;SAVE FAC IN PREVIOUSLY OPENED
```

```
        001046
55                                              ;    VARIABLE, CHECK FOR ")", AND
56                                              ;    RETURN TO THE BASIC INTERPRETER.
57              ;
```



```
1               ;       .SBTTL  "ACC" COMMAND PROCESSOR
2               ;
3               ;**************************************************************
4               ;
5               ; "ACC" COMMAND PROCESSOR
6               ;
7               ; BASIC FORM:   CALL "ACC"(BUF)
8               ;
9               ; PURPOSE:  ACCESS ENTIRE BUFFER "BUF".  THIS COMMAND RESETS
10              ;               ALL BUFFER POINTERS TO ALLOW FULL ACCESS TO
11              ;               THE ARRAY VIA THE "RDB" COMMAND.  THE "PUTD"
12              ;               POINTER IS PLACED AT THE END OF THE ARRAY AND
13              ;               THE "RDB" POINTER IS PLACED AT THE BEGINNING.
14              ;
15 00314        ACC:                            ;ENTRY POINT TO PROCESSOR
16 00314 004767         JSR     PC,POLENT       ;ENTER POLISH MODE AND CHECK
         001004
17                                              ;    FOR ENOUGH AREA TO WORK
18                                              ;    WITH AND THAT FIRST TOKEN
19                                              ;    IS INDEED A LEFT PARENS.
20 00320 000702'         +GETBUF                ;GET BUFFER ADDRESS FROM COMMAND
21                                              ;    AND CHECK IT AGAINST THE
22                                              ;    DEFINITION TABLE.
23 00322 000640'         +BUFRES                ;RESET BUFFER POINTERS
24 00324 000326'         .+2                    ;LEAVE POLISH MODE
25 00326 012762         MOV     #400,BAD(R2)    ;SET BAD ID INDICATING NEXT PUT
         000400
         000010
26                                              ;    BEFORE ANOTHER GET WILL CAUSE
27                                              ;    OVERLAY OF GOOD DATA.
28 00334 000137         JMP     @#CKRPAR        ;MAKE SURE LAST TOKEN IS A ")" AND
         001366'
29                                              ;    RETURN TO THE BASIC
30                                              ;    INTERPRETER.
31              ;
```

```
                        ;       .SBTTL  CKCMGN AND GETNUM
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINE TO CHECK NEXT TOKEN EQUAL TO A ,COMMA
                        ; AND THEN FETCH THE NEXT FLOATING POINT NUMERIC FROM INPUT
                        ; STRING.
                        ;
                        ; ROUTINE IS CALLED IN POLISH MODE
                        ;
                        ; REGISTERS USED:       EVAL USES R0, R2, AND R3
                        ;                       R1 IS BUMPED PAST VARIABLE
                        ;                       RESULT IS RETURNED IN FAC
                        ;
00340                   CKCMGN:
00340 122127            CMPB    (R1)+,#.COMMA   ;CHECK NEXT TOKEN EQUAL TO
      000000G
                                                ;     A ,COMMA.
00344 001402            BEQ     GETNUM          ;YES:  GET NUMERIC NOW
00346 000137            JMP     @#ERRSYN                ;SYNTAX ERROR
      000000G
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINE TO FETCH A FLOATING POINT NUMERIC FROM
                        ; INPUT STRING.
                        ;
                        ; ROUTINE IS CALLED IN POLISH MODE
                        ;
                        ; REGISTERS USED:       EVAL USES R0, R2, AND R3
                        ;                       R1 IS BUMPED PAST VARIABLE
                        ;                       RESULT IS RETURNED IN FAC
                        ;
00352                   GETNUM:
00352 004737            JSR     PC,@#EVAL       ;GET NUMERIC
      000000G
00356 103401            BCS     ERARG           ;ILLEGAL ARG TYPE
00360 000134            POLRET                  ;RETURN IN POLISH MODE
                        ;
00362 000137 ERARG:     JMP     @#ERRARG        ;ILLEGAL ARG TYPE
      000000G
                        ;
```



```
                        ;       .SBTTL  SAVE/RESTORE R2 AND FAC (SAVER2,SAVFAC, RESTR2)
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINES TO SAVE/RESTORE REGISTER R2 OR
                        ; THE FAC ON THE STACK.
                        ;
                        ; ALL ROUTINES ARE CALLED IN POLISH MODE
                        ;
                        ; REGISTERS USED:  ONLY THE STACK
                        ;
00366                   SAVER2:
00366 010246            MOV     R2,-(SP)        ;SAVE R2 ON THE STACK.
00370 000134            POLRET                  ;RETURN IN POLISH MODE
                        ;
00372                   SAVFAC:
00372 016546            MOV     FAC1(R5),-(SP)  ;SAVE THE FAC ON THE STACK
      000040
00376                   SAVINT:
00376 016546            MOV     FAC2(R5),-(SP)
      000042
00402 000134            POLRET                  ;RETURN IN POLISH MODE
                        ;
00404                   RESTR2:
00404 012602            MOV     (SP)+,R2        ;RESTORE R2 FROM THE STACK
00406 000134            POLRET                  ;RETURN IN POLISH MODE
                        ;
```

```
1                       ;       .SBTTL  INTERRUPT REGISTER SAVE/RESTORE ROUTINES
2                       ;
3                       ;*****************************************************************
4                       ;
5                       ; ROUTINES TO SAVE/RESTORE R0, R2 AND R3 ON STACK AND
6                       ; RETURN TO INTERRUPTED PROGRAM.
7                       ;
8  000410               REGSAV:
9  000410 010246                MOV     R2,-(SP)        ;PUSH R2 ON STACK
10 000412 016602                MOV     2(SP),R2        ;GET PC FROM CALL
           000002
11 000416 010066                MOV     R0,2(SP)        ;NOW PUT R0 THERE
           000002
12 000422 010346                MOV     R3,-(SP)        ;SAVE R3
13 000424 010207                MOV     R2,PC           ;RETURN TO CALLER
14                      ;
15 000426               RESTOR:
16 000426 012603                MOV     (SP)+,R3        ;RESTORE R3
17 000430 012602                MOV     (SP)+,R2        ;RESTORE R2
18 000432 012600                MOV     (SP)+,R0        ;RESTORE R0
19 000434 000002                RTI                     ;RETURN TO INTERRUPTED PROGRAM
20                      ;
```



```
1                       ;       .SBTTL  INST
2                       ;
3                       ;*****************************************************************
4                       ;
5                       ; POLISH ROUTINE TO INTEGERIZE FAC AND CHECK ITS
6                       ; RANGE AGAINST A GIVEN VALUE.
7                       ;
8                       ; ROUTINE IS CALLED IN POLISH MODE
9                       ;
10                      ; REGISTERS USED:       R0 ONLY
11                      ;                       T3(R5) MUST POINT TO RANGE ELEMENT
12                      ;                       (T3(R5) IS BUMPED BY 2 AFTER CALL)
13                      ;
14 000436               INTST:
15 000436 004737                JSR     PC,@#INT        ;INTEGERIZE RESULT
           000000G
16 000442 005765                TST     FAC1(R5)
           000040
17 000446 100433                BMI     ERNOR           ;NEGATIVE NUMBER IS ILLEGAL
18 000450 001416                BEQ     IN1             ;ALREADY IN AN INTEGER FORM
19 000452 026527                CMP     FAC1(R5),#44200 ;TEST NUMBER OUT OF RANGE
           000040
           044200
20                                                      ;    (I.E. >65535).
21 000460 103022                BHIS    IN2             ;YES:  SET EQUAL TO MAX (65535)
22 000462 156565                BISB    FAC1(R5),FAC2(R5); NUMBER MUST BE A 16 BIT INTEGER
           000040
           000042
23 000470 000365                SWAB    FAC2(R5)        ;    TO GET THIS FAR,  CONVERT IT
           000042
24 000474 052765                BIS     #100000,FAC2(R5) ;    TO ONE WORD THEN.
           100000
           000042
25 000502 005065 IN3:           CLR     FAC1(R5)
           000040
26 000506 026575 IN1:           CMP     FAC2(R5),@T3(R5) ;NUMBER IS IN 16 BIT FORM
           000042
           000062
27                                                      ;    NOW, MAKE SURE ITS IN RANGE.
28 000514 101010                BHI     ERNOR           ;NUMBER TO LARGE, "ARG ERROR"
29 000516 062765                ADD     #2,T3(R5)       ;BUMP TO NEXT RANGE FOR NEXT
           000002
           000062
30                                                      ;    CALL.
31 000524 000134                POLRET                  ;RETURN IN POLISH MODE
32 000526 012765 IN2:           MOV     #-1,FAC2(R5)    ;SET OVERFLOW EQUAL TO MAX (65535).
           177777
           000042
33 000534 000762                BR      IN3
34                      ;
35 000536               ERNOR:
36 000536 104400                TRAP    0
37 000540     116               .ASCII  /NOR/
   000541     117
   000542     122
38 000543     000               .BYTE   0
39                      ;
```

```
                        ;       .SBTTL  FLOAT
                        ;
                        ;*****************************************************************
                        ;
                        ; ROUTINE TO FLOAT A 16 BIT UNSIGNED INTEGER
                        ;
                        ; REGISTERS USED:        R3 ON CALL MUST HAVE 16 BIT NUMBER
                        ;                                TO FLOAT.
                        ;                        FAC HAS FLOATED RESULTED
                        ;
 00544                  FLOAT:
 00544 005703           FLOAT:  TST     R3              ;16 BIT NUMBER?
 00546 100017           BPL     FLOAT1          ;NO:  NUMBER OK AS IS THEN
 00550 010346           MOV     R3,-(SP)        ;PUT NUMBER ON STACK
 00552 042716           BIC     #100000,(SP)    ;IGNORE MOST SIGNIF. BIT
       100000
 00556 105016           CLRB    (SP)            ;CLEAR OUT LEAST SIGNIF.
 00560 000316           SWAB    (SP)            ;NOW MOVE MOST SIGNIF. TO RIGHT
                                                ;    BYTE
 00562 062716           ADD     #44000,(SP)     ;ADD IN EXPONENT
       044000
 00566 012665           MOV     (SP)+,FAC1(R5)  ;SAVE MOST SIGNIF. AND EXPONENT
       000040
 00572 010346           MOV     R3,-(SP)        ;NOW WORK ON LEAST SIGNIF.
 00574 000316           SWAB    (SP)
 00576 105016           CLRB    (SP)            ;CLEAR OUT THE REMAINING LEAST
                                                ;    SIGNIF. 8 BITS.
 00600 012665           MOV     (SP)+,FAC2(R5)  ;SAVE IN FAC NOW
       000042
 00604 000207           RETURN                  ;RETURN TO CALLER
                        ;
 00606 005065 FLOAT1:   CLR     FAC1(R5)        ;LEAVE AS INTEGER
       000040
 00612 010365           MOV     R3,FAC2(R5)
       000042
 00616 000207           RETURN                  ;RETURN TO CALLER.
                        ;
```



```
                        ;       .SBTTL  ENTERP & BUFRES
                        ;
                        ;*****************************************************************
                        ;
                        ; ROUTINE TO ENTER POLISH MODE FOR ONE ROUTINE AND THEN
                        ; EXIT BACK TO CALLER.
                        ;
                        ; CALL:
                        ;       JSR     PC,ENTERP       ;ENTER POLISH MODE
                        ;       .WORD   ROUTINE         ;ROUTINE TO ENTER
                        ;       NEXT INSTRUCTION        ;RETURN MADE HERE
                        ;
 00620                  ENTERP:
 00620 012704           ENTERP: MOV     #RETURP,R4      ;SETUP POLISH RETURN PC
       000630'
 00624 017607           MOV     @(SP),PC        ;CALL ROUTINE IN POLISH MODE
       000000
                        ;
 00630                  RETURP:
 00630 000632'          RETURP: .+2                     ;EXIT POLISH MODE
 00632 062716           ADD     #2,(SP)         ;BUMP PAST ARG
       000002
 00636 000207           RETURN                  ;RETURN TO CALLER
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINE TO RESET THE POINTERS (BOTH GET AND PUT) OF
                        ; A CIRCULAR BUFFER.  EFFECTIVELY EMPTIES THE BUFFER BEFORE
                        ; A SAMPLING OPERATION OCCURS.
                        ;
                        ; ROUTINE IS CALLED IN POLISH MODE
                        ;
                        ;                               R2 ON CALL MUST CONTAIN ADDRESS
                        ;                               OF BUFFER IN DESCRIPTOR TABLE.
                        ;                               NO REGISTERS (GENERAL PURPOSE)
                        ;                               ARE ALTERED BY THE ROUTINE.
                        ;
 00640                  BUFRES:
 00640 011262           BUFRES: MOV     (R2),PUT(R2)    ;RESET THE GET AND PUT POINTERS
       000004
 00644 011262           MOV     (R2),GET(R2)
       000006
 00650 005062           CLR     BAD(R2)         ;CLEAR OUT BAD DATA FLAG
       000010
 00654 000134           POLRET                  ;RETURN IN POLISH MODE
                        ;
                        ;
```

```
                        ;       .SBTTL  GETV AND GETBUF
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINE TO CALCULATE ADDRESS OF VARIABLE
                        ; SPECIFIED IN THE INPUT LINE.
                        ;
                        ; ROUTINE IS CALLED IN POLISH MODE
                        ;
                        ; REGISTERS USED:       EVAL USES R0, R2, AND R3
                        ;                       R1 IS BUMPED PAST VARIABLE
                        ;                       RESULT IS STORED IN VARSAV(R5)
                        ;
00656                   GETV:
00656 112102                    MOVB    (R1)+,R2        ;BUILD WORD OFFSET
00660 100406                    BMI     SYNER           ;TOKEN ILLEGAL HERE
00662 000302                    SWAB    R2
00664 152102                    BISB    (R1)+,R2
00666 061502                    ADD     (R5),R2         ;R2 NOW POINTS TO SYMBOL TABLE ENTRY
00670 004737                    JSR     PC,@#GETVAR     ;GET NAME AND SUBSCRIPTS SET UP
      000000G
00674 000134                    POLRET                  ;RETURN IN POLISH MODE
                        ;
00676 000137 SYNER:     JMP     @#ERRSYN        ;SYNTAX ERROR
      000000G
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINE TO FETCH NEXT VARIABLE FROM INPUT LINE,
                        ; TEST FOR AN ARRAY NAME AND CALCULATE THE POSITION
                        ; IN THE ARRAY FROM SUBSCRIPTS WHICH MAY BE GIVEN.
                        ;
                        ; ROUTINE IS CALLED IN POLISH MODE
                        ;
                        ; ON EXIT:               R0 POINTS TO ARRAY BASE ADDRESS
                        ;                       R1 IS BUMPED PAST ARRAY NAME
                        ;                       R2 POINTS TO SYMBOL TABLE ADDRESS
                        ;                       R3 POINTS TO END OF ARRAY
                        ;                       VARSAV(R5) POINTS TO ACTUAL ARRAY ADDRESS
                        ;
                        ; ROUTINE FALLS THROUGH TO CKBUF.
                        ;
00702                   GETBUF:
00702 004767                    JSR     PC,GETADD       ;CALCULATE ARRAY ADDRESS FROM
      000310
                                                        ;       ARRAY NAME POINTED TO BY R1.
00706 026503                    CMP     VARSAV(R5),R3   ;DETERMINE IF GIVEN SUBSCRIPTED
      000022
                                                        ;       ARRAY IS WITHIN BOUNDS OF
                                                        ;       DIMENSIONED ARRAY.
00712 103016                    BHIS    ERBUF           ;BUFFER ERROR
                        ;
```

17


```
                        ;       .SBTTL  CKBUF
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINE TO CHECK IF ARRAY ADDRESS SPECIFIED
                        ; IN VARSAV(R5) HAS BEEN DEFINED BY A "USE" COMMAND.  IF SO,
                        ; THE ENTRY ADDRESS IN THE TABLE IS RETURNED IN R2 AND THE
                        ; ARRAY POINTERS INITIALIZED.
                        ;
                        ; ROUTINE IS CALLED IN POLISH MODE
                        ;
                        ; CALL IS MADE WITH STARTING ADDRESS OF ARRAY IN VARSAV(R5)
                        ;
                        ; REGISTERS USED: ON EXIT, R2 HAS TABLE ZDNJWUWWUVUSS
                        ;                       FOR THIS BUFFER.
                        ;
00714                   CKBUF:
00714 012702                    MOV     #NARRAY,R2      ;SET UP TO SEARCH "USE" DEFINITION
      000005
00720 012746                    MOV     #TABLE,-(SP)    ;       TABLE.
      000000'
00724 027665 CK2:       CMP     @(SP),VARSAV(R5) ;MATCH?
      000000
      000022
00732 001002                    BNE     CK1             ;NO:  LOOK AT NEXT ENTRY
00734 012602                    MOV     (SP)+,R2        ;RETURN ENTRY ADDRESS IN R2
00736 000134                    POLRET                  ;RETURN IN POLISH MODE
00740 062716 CK1:       ADD     #14,(SP)        ;LOOK AT NEXT ENTRY
      000014
00744 005302                    DEC     R2              ;ALL DONE?
00746 003366                    BGT     CK2             ;NO:  CONTINUE
00750                   ERBUF:                          ;NOT FOUND:  BUFFER ERROR
00750 104400                    TRAP    0
00752    102                    .ASCII  /BUF/
00753    125
00754    106
00755    000                    .BYTE   0
                        ;
```

```
                ;       .SBTTL  GETDAT
                ;
                ;*****************************************************************
                ;
                ; ROUTINE TO TEST USER'S BUFFER FOR DATA, AND IF IT
                ; EXISTS, REMOVE IT AND RETURN IN R3.
                ;
                ; CALL:
                ;       JSR     PC,GETDAT
                ;
                ; REGISTERS USED:       R2 MUST POINT TO BUFFER DESCRIPTOR
                ;                               BLOCK ADDRESS BEFORE CALL.
                ;                       R3 WILL HAVE DATA ON RETURN,
                ;                       CARRY WILL BE SET IF AN ERROR OCCURED.
                ;                               IN THIS CASE, R3 AND THE FAC
                ;                               WILL HAVE THE ERROR CODE.
                ;
                ;
00756           GETDAT:
00756 000241            CLC                     ;CLEAR CARRY BIT IN PS
00760 016746            MOV     PS,-(SP)        ;SAVE CURRENT PS ON STACK
      177776'
00764 052767            BIS     #340,PS         ;RAISE TO LEVEL 7 FOR PROTECTION
      000340
      177776'
00772 005065            CLR     FAC1(R5)        ;ALWAYS AN INTEGER RETURNED
      000040
00776 105762            TSTB    BAD(R2)         ;CHECK TO SEE IF DATA OVERRUN
      000010
                                                ;       OCCURRED.
01002 001034            BNE     GET1            ;YES:  RETURN -1 AS VALUE OF DATA
01004 026262            CMP     GET(R2),PUT(R2) ;DOES DATA EXIST?
      000006
      000004
01012 001422            BEQ     GET2            ;PROBABLY NOT, BUT CHECK FOR FULL
                                                ;       BUFFER ANYWAY.
01014 005062 GET0:      CLR     BAD(R2)         ;CLEAR BAD DATA FLAG IF SET
      000010
01020 017203            MOV     @GET(R2),R3     ;GET DATA
      000006
01024 062762            ADD     #2,GET(R2)      ;UPDATE POINTER
      000002
      000006
01032 026262            CMP     GET(R2),END(R2) ;DID IT CAUSE A WRAP AROUND?
      000006
      000002
01040 101402            BLOS    GET3            ;NO
01042 011262            MOV     (R2),GET(R2)    ;WRAP POINTER AROUND
      000006
01046 010365 GET3:      MOV     R3,FAC2(R5)     ;SAVE RESULT IN FAC AS AN INTEGER
      000042
01052 012667            MOV     (SP)+,PS        ;RESTORE PS
      177776'
01056 000207            RETURN                  ;RETURN TO CALLER
                ;
01060 105762 GET2:      TSTB    BAD+1(R2)       ;IS THERE REALY DATA HERE?
      000011
01064 001353            BNE     GET0            ;YES:  GO GET IT THEN
```



```
01066 012703            MOV     #-2,R3          ;INDICATE NO DATA EXISTS YET
      177776
01072 000404            BR      GET4
01074 012703 GET1:      MOV     #-1,R3          ;INDICATE DATA OVERRUN OCCURRED.
      177777
01100 105062            CLRB    BAD(R2)         ;CLEAR OUT BAD DATA FLAG
      000010
                                                ;       SO NEXT FETCH WILL RESULT
                                                ;       IN GOOD DATA.
01104 005216 GET4:      INC     (SP)            ;SET CARRY SHOWING FAILURE
01106 000757            BR      GET3            ;RETURN
                ;
```

```
                        ;       .SBTTL  STODAT
                        ;
                        ;*****************************************************************
                        ;
                        ; ROUTINE TO STORE DATA INTO USER'S BUFFER AND TEST FOR
                        ; DATA OVERFLOW.
                        ;
                        ; CALL:
                        ;       JSR     PC,STODAT
                        ;
                        ; REGISTERS USED:       R2 MUST HAVE BUFFER DESCRIPTOR BLOCK
                        ;                           ADDRESS BEFORE CALL.
                        ;                       R3 MUST HAVE DATA TO INSERT BEFORE
                        ;                           CALL.
                        ;                       R3 IS DESTROYED ON RETURN
                        ;
01110                   STODAT:
01110 016746            MOV     PS,-(SP)        ;SAVE CURRENT PS ON STACK
      177776'
01114 052767            BIS     #340,PS         ;RAISE TO LEVEL 7 FOR PROTECTION
      000340
      177776'
01122 105762            TSTB    BAD+1(R2)       ;OVERRUN BIT SET?
      000011
01126 001025            BNE     NOROOM          ;YES:  SET OVERFLOW FLAG
01130 016246            MOV     PUT(R2),-(SP)   ;UPDATE PUT POINTER
      000004
01134 062716            ADD     #2,(SP)
      000002
01140 021662            CMP     (SP),END(R2)    ;DID IT CAUSE A WRAP AROUND?
      000002
01144 101401            BLOS    NOWRAP          ;NO
01146 011216            MOV     (R2),(SP)       ;WRAP POINTER AROUND
01150 021662 NOWRAP:    CMP     (SP),GET(R2)    ;WILL WE OVERRUN THE GET POINTER
      000006
                                                ;     NEXT TIME?
01154 001003            BNE     STOD1           ;NO
01156 152762            BISB    #1,BAD+1(R2)    ;YES:  REMEMBER THIS THEN
      000001
      000011
01164 010372 STOD1:     MOV     R3,@PUT(R2)     ;SAVE DATA
      000004
01170 012662            MOV     (SP)+,PUT(R2)   ;SAVE NEW PUT POINTER ALSO
      000004
01174 012667            MOV     (SP)+,PS        ;RESTORE PS
      177776'
01200 000207            RETURN                  ;RETURN TO CALLER
                        ;
01202 052762 NOROOM:    BIS     #1,BAD(R2)      ;REMEMBER THAT BAD DATA EXISTS
      000001
      000010
01210 016246            MOV     PUT(R2),-(SP)   ;DON'T UPDATE THE PUT POINTER
      000004
01214 000763            BR      STOD1           ;RESTORE PS AND RETURN TO CALLER
                        ;
```

19


```
                        ;       .SBTTL  GETADD
                        ;
                        ;*****************************************************************
                        ;
                        ; ROUTINE TO CALCULATE ARRAY ADDRESS FROM ARRAY NAME
                        ; POINTED TO BY R1.
                        ;
                        ; REGISTERS ON RETURN:  R0 POINTS TO ARRAY BASE ADDRESS
                        ;                       R1 IS UPDATED PAST ARRAY NAME
                        ;                       R2 POINTS TO SYMBOL TABLE ENTRY
                        ;                       R3 HAS ADDRESS OF END OF ARRAY
                        ;                       VARSAV(R5) POINTS TO ENTRY TO ARRAY
                        ;
01216                   GETADD:
01216 112102            MOVB    (R1)+,R2        ;BUILD WORD OFFSET
01220 100450            BMI     SYNERR          ;TOKEN ILLEGAL HERE
01222 000302            SWAB    R2
01224 152102            BISB    (R1)+,R2
01226 061502            ADD     (R5),R2         ;R2 NOW POINTS TO SYMBOL TABLE
01230 022712            CMP     #177776,(R2)    ;VARIABLE MUST BE AN ARRAY
      177776
01234 001042            BNE     SYNERR          ;SYNTAX ERROR IF NOT
01236 010246            MOV     R2,-(SP)        ;SAVE R2 TEMP
01240 004737            JSR     PC,@#GETVAR     ;GET NAME AND SUBSCRIPTS SET UP
      000000G
01244 012602            MOV     (SP)+,R2        ;RESTORE R2
01246 022765            CMP     #-1,SS2SAV(R5)  ;SINGLY SUBSCRIPTED ARRAYS ONLY,
      177777
      000026
01254 001032            BNE     SYNERR
01256 016203            MOV     2(R2),R3        ;GET ADDRESS OF ARRAY
      000002
01262 010300            MOV     R3,R0           ;CALCULATE EXACT ARRAY ADDRESS
01264 010065            MOV     R0,VARSAV(R5)   ;     FROM GIVEN SUBSCRIPTS.
      000022
01270 005765            TST     SS1SAV(R5)
      000024
01274 100405            BMI     G1              ;NO SUBSCRIPTS GIVEN.
01276 006365            ASL     SS1SAV(R5)      ;CONVERT SUBSCRIPT TO A WORD OFFSET
      000024
01302 066565            ADD     SS1SAV(R5),VARSAV(R5) ;SUBSCRIPT PLUS ARRAY ADDRESS
      000024
      000022
01310 016246 G1:        MOV     4(R2),-(SP)     ;(* 4 * BYTE SUBSCRIPTS)
      000004
01314 006316            ASL     (SP)
01316 006316            ASL     (SP)
01320 062603            ADD     (SP)+,R3
01322 000207            RETURN                  ;RETURN TO CALLER
                        ;
```

```
                        ;       .SBTTL  POLENT, CKLPAR AND CKCOMA
                        ;
                        ;*****************************************************************
                        ;
                        ; ENTER POLISH MODE OPERATION
                        ;
                        ; REGISTERS USED:       R4 BECOMES THE POLISH PC.
                        ;
 001324                 POLENT:
 01324 012604                   MOV     (SP)+,R4        ;GET PC FROM CALLER AND SETUP
                                                        ;    THE POLISH PC.
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINE TO CHECK CHARACTER POINTED TO BY R1 EQUAL
                        ; TO A LEFT PARENS.  A TEST IS THEN MADE TO INSURE
                        ; THAT WE STILL HAVE ROOM LEFT TO WORK WITH.
                        ;
                        ; ROUTINE IS CALLED IN POLISH MODE
                        ;
                        ; REGISTERS USED:       R1 GETS BUMPED BY 1
                        ;
 01326                  CKLPAR:
 01326 122127                   CMPB    (R1)+,#,LPAR    ;FIRST CHAR MUST BE A LEFT
        000000G
                                                        ;    PARENS.
 01332 001003                   BNE     SYNERR          ;NO:  SYNTAX ERROR
 01334 020604                   CMP     SP,R4           ;CHECK ROOM NOW
 01336 103403                   BLO     ERPDL           ;OUT OF ROOM, TELL USER
 01340 000134                   POLRET                  ;RETURN IN POLISH MODE
 01342                  SYNERR:
 01342 000137                   JMP     @#ERRSYN        ;SYNTAX ERROR
        000000G
 01346                  ERPDL:
 01346 000137                   JMP     @#ERRPDL        ;OUT OF ROOM
        000000G
                        ;
                        ;*****************************************************************
                        ;
                        ; POLISH ROUTINE TO CHECK CHARACTER POINTED TO BY R1
                        ; EQUAL TO A ,COMMA.
                        ;
                        ; ROUTINE IS CALLED IN POLISH MODE
                        ;
                        ; REGISTERS USED:  R1 GETS BUMPED BY ONE.
                        ;
 01352                  CKCOMA:
 01352 122127                   CMPB    (R1)+,#,COMMA   ;FIRST CHAR MUST BE A COMMA
        000000G
 01356 001371                   BNE     SYNERR          ;NO: SYNTAX ERROR
 01360 000134                   POLRET                  ;RETURN IN POLISH MODE
                        ;
```



```
                        ;       .SBTTL  STORXT AND CKRPAR
                        ;
                        ;*****************************************************************
                        ;
                        ; COMMON EXIT ROUTINE TO STORE FAC IN VARIABLE SET UP
                        ; IN VARSAV(R5), CHECK LAST TOKEN EQUAL TO A RIGHT
                        ; PARENS (ALTERNATE ENTRY POINT TO ROUTINE), AND
                        ; RETURN TO THE BASIC INTREPRETER.
                        ;
 01362                  STORXT:
 01362 004737                   JSR     PC,@#STOVAR     ;SAVE FAC
        000000G
 01366                  CKRPAR:
 01366 122127                   CMPB    (R1)+,#,RPAR    ;MAKE SURE LAST TOKEN IS A
        000000G
                                                        ;    RIGHT PARENS.
 01372 001363                   BNE     SYNERR          ;SYNTAX ERROR IF NOT
 01374 000207                   RETURN                  ;RETURN TO THE BASIC INTREPRETER
                        ;
```

```
                        ;       .SBTTL  CONVERT BCD TO BINARY
                        ;
                        ;**************************************************************
                        ;
                        ; ROUTINE TO CONVERT BCD TO BINARY
                        ;
                        ; CALL:
                        ;       JSR     PC,CONBCD
                        ;
                        ; REGISTERS USED:        R3 MUST CONTAIN BCD NUMBER BEFORE CALL
                        ;                        R3 WILL HAVE BINARY RESULT ON RETURN
                        ;
 01376                  CONBCD:
 01376 010046           CON:    MOV     R0,-(SP)        ;SAVE REGISTERS R0, R2, AND R4
 01400 010246                   MOV     R2,-(SP)        ;    ON THE STACK
 01402 010446                   MOV     R4,-(SP)
 01404 012700                   MOV     #4,R0           ;4 BCD DIGITS TO DECODE
       000004
 01410 005046                   CLR     -(SP)           ;ACCUMULATE AREA
 01412 012702           CON1:   MOV     #4,R2           ;4 SHIFTS / BCD CHAR
       000004
 01416 005004                   CLR     R4              ;CLEAR OUT WORK AREA
 01420 006103           CON2:   ROL     R3              ;SHIFT CHAR OUT
 01422 006104                   ROL     R4
 01424 005302                   DEC     R2              ;4 SHIFTS YET?
 01426 003374                   BGT     CON2            ;NO:  CONTINUE
 01430 011646                   MOV     (SP),-(SP)      ;MULTIPLY ACCUMULATED DIGITS BY 10
 01432 006316                   ASL     (SP)
 01434 006316                   ASL     (SP)
 01436 062616                   ADD     (SP)+,(SP)
 01440 006316                   ASL     (SP)
 01442 060416                   ADD     R4,(SP)         ;ADD IN NEW DIGIT
 01444 005300                   DEC     R0              ;IS THIS THE LAST BCD CHARACTER?
 01446 003361                   BGT     CON1            ;NO:  CONTINUE
                        ;
 01450 012603                   MOV     (SP)+,R3        ;RESULT RETURNED IN R3
 01452 012604                   MOV     (SP)+,R4        ;RESTORE ALL REGISTERS
 01454 012602                   MOV     (SP)+,R2
 01456 012600                   MOV     (SP)+,R0
 01460 000207                   RETURN                  ;RETURN TO CALLER
                        ;
        000001'         .END                            ;END OF MODULE #0
```


SYMBOL TABLE

```
ACC     000314RG        BAD   = 000010          BCDON   000077RG
BEG   = 000000          BUFRES  000640RG        CKBUF   000714R
CKCMGN  000340RG        CKCOMA  001352RG        CKLPAR  001326R
CKRPAR  001366RG        CK1     000740R         CK2     000724R
CONBCD  001376RG        CON1    001412R         CON2    001420R
DEL   = 000012          DRSBUF  000100RG        DRSNPT  000102RG
DRSON   000075RG        END   = 000002          ENTERP  000620RG
ERARG   000362R         ERBUF   000750RG        ERNOR   000536RG
ERPDL   001346R         ERRARG= ****** G         ERRPDL= ****** G
ERRSYN= ****** G        EVAL  = ****** G         FAC1  = 000040
FAC2  = 000042          FLOAT   000544RG        FLOAT1  000606R
GET   = 000006          GETADD  001216RG        GETBUF  000702RG
GETDAT  000756RG        GETNUM  000352RG        GETV    000656RG
GETVAR= ****** G        GET0    001014R         GET1    001074R
GET2    001060R         GET3    001046R         GET4    001104R
G1      001310R         HISTON  000076RG        INT   = ****** G
INTST   000436RG        IN1     000506R         IN2     000526R
IN3     000502R         LPSAD = ****** G        LPSDR = ****** G
NARRAY= 000005 G        NOROOM  001202R         NOWRAP  001150R
NUMSGN= ****** G        PC    =%000007          POLENT  001324RG
POLRET= 000134          PS    = 177776          PUT   = 000004
RDB     000256RG        RDB1    000310R         REGSAV  000410RG
RESTOR  000426RG        RESTR2  000404RG        RETURN= 000207
RETURP  000630R         RTSON   000074RG        R0    =%000000
R1    =%000001          R2    =%000002          R3    =%000003
R4    =%000004          R5    =%000005          SAVER2  000366RG
SAVFAC  000372RG        SAVINT  000376RG        SP    =%000006
SS1SAV= 000024          SS2SAV= 000026          STODAT  001110RG
STOD1   001164R         STORXT  001362RG        STOVAR= ****** G
SYNER   000676R         SYNERR  001342R         TABLE   000000RG
T3    = 000062          USE     000104RG        USE1    000236R
USE2    000126R         USE3    000122R         USE4    000222R
VARSAV= 000022          .COMMA= ****** G         .LPAR = ****** G
.RPAR = ****** G
. ABS.  000000      000
        001462      001
ERRORS DETECTED: 0
FREE CORE: 18142. WORDS

.LP1:=LPS0
```

```
1               .TITLE  LPS1  V01-01
2               ;.SBTTL LPS MODULE #1
3               ;
4               ; DEC-11-LBEXA-B-LA2    BASIC KERNEL V02-01
5               ;
6               ; COPYRIGHT (C) 1973,1974
7               ;
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26              ;
27              ; WRITTEN BY:  RICK HULLY       FEB., 1973
28              ;
```

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```
1               ;       .SBTTL  CONTENTS OF MODULE #1
2               ;
3               ; THE FOLLOWING COMMAND PROCESSORS EXIST IN THIS MODULE:
4               ;
5               ;       ADC
6               ;       RTS
7               ;       LED
8               ;
```

```
1               ;       .SBTTL  PROGRAM GLOBALS
2               ;
3               ; GLOBALS REQUIRED FOR COMMUNICATION WITH THE BASIC
4               ; INTREPRETER.
5               ;
6                       .GLOBL  ERRPDL,ERRSYN,ERRARG
7                       .GLOBL  EVAL,GETVAR,STOVAR
8                       .GLOBL  INT,.COMMA,.RPAR
9                       .GLOBL  NUMSGN,.LPAR
10              ;
11              ; GLOBALS REQUIRED FOR COMMUNICATIONS WITH THE VARIOUS
12              ; LPS MODULES.
13              ;
14                      .GLOBL  TABLE,NARRAY,FLOAT
15                      .GLOBL  POLENT,GETADD,GETNUM
16                      .GLOBL  CKCMGN,INTST,GETV
17                      .GLOBL  GETBUF,REGSAV,ERNOR
18                      .GLOBL  STORXT,CKRPAR,ERBUF
19                      .GLOBL  CKCOMA,ENTERP,STODAT
20                      .GLOBL  GETDAT,RTSON,DRSON
21                      .GLOBL  SAVER2,SAVFAC,RESTR2
22                      .GLOBL  RESTOR,HISTON,BCDON
23                      .GLOBL  CONBCD,BUFRES,DRSNPT
24                      .GLOBL  SAVINT
25              ;
26              ; GLOBALS REQUIRED FOR COMMAND PROCESSORS
27              ;
28                      .GLOBL  ADC,RTS,LED
29              ;
30              ; GLOBALS FOR DEVICE ADDRESSES
31              ;
32                      .GLOBL  LPSAD,LPSADB,LPSDR,LPSDMA
33              ;
34              ; GLOBALS FOR INTERRUPT PRIORITY AND VECTOR DEFINITION:
35                      .GLOBL  LPSIVA,LPSIP
```

23


```
1               ;       .SBTTL  REGISTER ASSIGNMENTS AND EQUATES
2               ;
3       000000 R0       =       %0
4       000001 R1       =       %1
5       000002 R2       =       %2
6       000003 R3       =       %3
7       000004 R4       =       %4
8       000005 R5       =       %5
9       000006 SP       =       %6
10      000007 PC       =       %7
11              ;
12              ; GENERAL EQUATES
13              ;
14      177776 PS       =       -2              ;PS = PROCESSOR STATUS WORD
15      000207 RETURN   =       207             ;207 = RTS PC
16      000134 POLRET   =       134             ;134 = JMP @(R4)+
17              ;
18              ; BASIC USER'S EQUATES
19              ;
20      000022 VARSAV   =       22              ;VAR SAVE FOR ASSIGNMENT
21      000024 SS1SAV   =       24              ;SS1 SAVE FOR ASSIGNMENT
22      000026 SS2SAV   =       26              ;SS2 SAVE FOR ASSIGNMENT
23      000040 FAC1     =       40              ;HIGH ORDER FLOATING VALUE
24      000042 FAC2     =       42              ;LOW  ORDER FLOATING VALUE
25      000062 T3       =       62              ;SHORT TERM TEMPORARY
26              ;
27              ; BUFFER DESCRIPTOR EQUATES
28              ;
29      000000 BEG      =       0               ;OFFSET TO BEGINNING OF BUFFER POINTER
30      000002 END      =       2               ;OFFSET TO END OF BUFFER POINTER
31      000004 PUT      =       4               ;OFFSET TO PUT DATA POINTER
32      000006 GET      =       6               ;OFFSET TO GET DATA POINTER
33      000010 BAD      =       10              ;OFFSET TO BAD DATA FLAG
34      000012 DEL      =       12              ;OFFSET TO DISPLAY DELTA X
35              ;
36              ; LIMIT TEST
37              ;
38 00000 000020 MAXA:   .WORD   20              ;16
39 00002 000020         .WORD   20              ;16
40 00004 177777         .WORD   177777          ;65535
41 00006 000017         .WORD   17              ;17
42              ;
43              ; INTERRUPT VECTOR SET UP
44              ;
45              ;
46              ; NON-REENTRANT VARIABLES
47              ;
48 00010 000000 RTSBUF: .WORD   0               ;RTS COMMAND (BUFFER DESCRIPTOR
49                                              ;     ADDRESS)
50 00012 000000 RTSNPT: .WORD   0               ;RTS COMMAND (NBR OF POINTS)
51 00014 000000 RTSSC:  .WORD   0               ;RTS COMMAND (STARTING CHANNEL)
52 00016 000000 RTSNSC: .WORD   0               ;RTS COMMAND (NBR OF SUCCESSIVE
53                                              ;     CHANNELS)
54 00020 000000 RTSMOD: .WORD   0               ;RTS COMMAND MODE
55 00022 000000 RTSEND: .WORD   0               ;RTS COMMAND END ADDRESS FOR
56                                              ;     DMA OPERATIONS
57 00024 000000 RTSCSR: .WORD   0               ;RTS COMMAND CSR SETTING
```

```
58 00026 000000 CNT:    .WORD   0               ;COUNTER USED BY LED COMMAND
59 00030 000000 LEDRES: .WORD   0,0,0,0         ;STORAGE AREA FOR LED CHARACTERS
   00032 000000
   00034 000000
   00036 000000
60 00040     017 BLANK: .BYTE   17,17,17,17,17,17,17,17 ;7 LED BLANK CHARACTERS FOR PADDING
   00041     017
   00042     017
   00043     017
   00044     017
   00045     017
   00046     017
61 00047     015 MINUS: .BYTE   15              ;LED MINUS CHARACTER
62                 ;
```

24


```
1                  ;       .SBTTL  "ADC" COMMAND PROCESSOR
2                  ;
3                  ;**********************************************************************
4                  ;
5                  ; "ADC" COMMAND PROCESSOR
6                  ;
7                  ; BASIC FORM:   CALL "ADC"(CHAN,VAR)
8                  ;
9                  ; PURPOSE:  INITIATE AN A/D CONVERSION FROM THE SPECIFIED
10                 ;               CHANNEL (0 <= CHAN <= 15), WAIT FOR IT TO
11                 ;               COMPLETE, AND RETURN A FLOATING POINT RESULT
12                 ;               IN "VAR" (0 <= VAR <= 4095) AS THE VALUE OF THE
13                 ;               FUNCTION.  THE A/D CANNOT BE CURRENTLY IN-
14                 ;               VOLVED IN A REAL TIME SAMPLING (RTS)
15                 ;               OPERATION.
16                 ;
17 00050           ADC:                            ;ENTRY POINT TO PROCESSOR
18 00050 105737            TSTB    @#RTSON         ;RTS OPERATION CURRENTLY UNDERWAY?
           000000G
19 00054 001403            BEQ     ADC2            ;NO:  CONTINUE
20 00056 104400            TRAP    0
21 00060     101           .ASCII  /ADC/           ;    IN PROGRESS.
   00061     104
   00062     103
22 00063     000           .BYTE   0
23 00064 012765 ADC2:      MOV     #MAXA,T3(R5)    ;FOR LIMIT TESTING OF "CHAN"
           000000'
           000062
24 00072 004737            JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
           000000G
25                                                 ;    FOR ENOUGH AREA TO WORK
26                                                 ;    WITH AND THAT FIRST TOKEN
27                                                 ;    IS INDEED A LEFT PARENS,
28 00076 000000G           +GETNUM                 ;GET CHANNEL FROM COMMAND STRING
29 00100 000000G           +INTST                  ;TEST <= 15.
30 00102 000000G           +CKCOMA                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
31 00104 000106'           .+2                     ;EXIT POLISH MODE
32 00106 000365            SWAB    FAC2(R5)        ;SETUP A/D CHANNEL #
           000042
33 00112 005265            INC     FAC2(R5)        ;INSERT A/D START BIT
           000042
34 00116 016537            MOV     FAC2(R5),@#LPSAD ;START CONVERSION ON SPECIFIED CHANNEL
           000042
           000000G
35 00124 004737            JSR     PC,@#ENTERP     ;ENTER IMMEDIATE POLISH MODE TO GET
           000000G
36 00130 000000G           +GETV                   ;    VARIABLE ADDRESS.
37 00132 105737 ADC1:      TSTB    @#LPSAD         ;CHECK DONE FLAG ON THIS CHANNEL
           000000G
38 00136 100375            BPL     ADC1            ;NOT READY YET
39 00140 013765            MOV     @#LPSADB,FAC2(R5) ;GET RESULT IN FAC
           000000G
           000042
40 00146 005065            CLR     FAC1(R5)        ;MOST SIGNIF. IS ALWAYS ZERO
           000040
41 00152 000137            JMP     @#STORXT        ;STORE RESULT IN PREVIOUSLY OPENED
           000000G
```

```
42                                      ;    VARIABLE, CHECK FOR ")" AND
43                                      ;    RETURN TO THE BASIC INTERPRETER.
44              ;
```

25


```
1               ;       .SBTTL  "RTS" COMMAND PROCESSOR
2               ;
3               ;*****************************************************************
4               ;
5               ; "RTS" COMMAND PROCESSOR
6               ;
7               ; BASIC FORM:   CALL "RTS"(BUF,SC,NSC,NPTS,MODE)
8               ;
9               ; PURPOSE:  PERFORM REAL TIME BUFFERED/CLOCKED SAMPLING OF THE
10              ;               A/D.  THE A/D CAN BE ENABLED WITH A VARIETY
11              ;               OF OPERATIONS DEPENDING ON THE "MODE" SPECIFIED.
12              ;               THE NORMAL MODE OF OPERATION (MODE=0) CAUSES
13              ;               THE A/D TO SAMPLE WHENEVER ST #1 FIRES.
14              ;               TO ENABLE OTHER OPTIONS, MERELY ADD THEIR CODE
15              ;               NUMBER TO THE MODE.  THE FOLLOWING LIST
16              ;               DESCRIBES OPTIONS AVAILABLE (ALL OPTIONS ARE
17              ;               NORMALLY DISABLED):
18              ;
19              ;               CODE    OPTION
20              ;                +1  ENABLE BURST MODE (USED ONLY WITH DMA)
21              ;                +2  ENABLE CLOCK AND DISABLE ST #1
22              ;                +4  ENABLE DUAL SAMPLE AND HOLD
23              ;               +10  ENABLE DMA (10 OCTAL)
24              ;
25              ;               THE A/D WILL BE STARTED BY A CLOCK OVERFLOW
26              ;               OR SCHMITT TRIGGER #1 (ST).  POINTERS WILL BE
27              ;               BE USED TO DETERMINE IF GOOD DATA EXISTS IN THE
28              ;               BUFFER ARRAYS OR IF DATA WRAP AROUND OCCURS.
29              ;               SINCE DATA IS STORED IN CIRCULAR BUFFERS (EX-
30              ;               CLUDING DMA OPERATIONS), POINTERS WILL BE USED
31              ;               TO INSURE THAT INCOMING DATA RATE DOES NOT
32              ;               EXCEED THE REMOVAL RATE.  A BAD DATA INDICATOR
33              ;               WILL BE SET WHEN DATA OVER-RUN OCCURS.  THE
34              ;               BUFFER POINTERS ARE INITIALLY RESET BEFORE THE
35              ;               SAMPLING OPERATION BEGINS.
36              ;
37              ;               A/D CHANNELS ARE SAMPLED ON EVERY CLOCK OVERFLOW
38              ;               OR FIRING OF ST #1 WITH THE RESULT STORED IN
39              ;               CONSECUTIVE DATA CELLS.  DATA IS STORED IN
40              ;               IDENTICAL FORMAT AS THAT READ FROM THE A/D.  WHEN
41              ;               A CLOCK OVERFLOW OR ST OCCURS, THE A/D SAMPLES
42              ;               THE FIRST CHANNEL SPECIFIED BY "SC" AND THEN
43              ;               SAMPLES THE NEXT "NSC" -1 CONSECUTIVE CHANNELS.
44              ;               SAMPLING THEN CONTINUES UNTIL "NPTS" CLOCK OVERFLOWS
45              ;               OR ST'S HAVE BEEN RECEIVED.
46              ;
47              ;               IN DUAL SAMPLE AND HOLD MODE, THE "NSC" PARAMETER
48              ;               IS THE NUMBER OF PAIRS OF CHANNELS TO REAL PER
49              ;               EVENT.
50              ;
51              ;               DMA OPERATIONS MAY/MAY NOT USE DUAL SAMPLE AND HOLD.
52              ;               DMA ALLOWS DIRECT HARDWARE STORAGE OF A/D
53              ;               RESULTS IN A SPECIFIED BUFFER ARRAY.  A MAXIMUM
54              ;               OF 4096 SAMPLES MAY BE TAKEN AT ANY
55              ;               ONE TIME WITH REMOVAL OF DATA ALLOWED ONLY
56              ;               WHEN THE BUFFER IS COMPLETELY FILLED.  THE
57              ;               "NSC" PARAMETER IS IGNORED AND IS CONSIDERED
```

```
58                      ;               ONE.
59                      ;
60                      ;               IF NPTS IS GIVEN AS ZERO, ANY RTS SAMPLING
61                      ;               CURRENTLY IN PROGRESS IS DISABLED.
62                      ;
63 00156               RTS:                                    ;ENTRY POINT TO PROCESSOR
64 00156 012737                MOV     #ADCINT,@#LPSIVA        ;SET INT. SERVICE ROUTINE ENTRY POINT.
         001040'
         000000G
65 00164 012737                MOV     #300,@#LPSIP            ;SET INT. PRIORITY.
         000300
         000000G
66 00172 012765                MOV     #MAXA,T3(R5)    ;FOR LIMIT CHECKS ON ALL INTEGERS
         000000'
         000062
67 00200 005037                CLR     @#LPSAD         ;STOP ANY PREVIOUS RTS OPERATION.
         000000G
68 00204 105037                CLRB    @#RTSON
         000000G
69 00210 004737                JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
         000000G
70                                                      ;       FOR ENOUGH AREA TO WORK
71                                                      ;       WITH AND THAT FIRST TOKEN
72                                                      ;       IS INDEED A LEFT PARENS.
73 00214 000000G               +GETBUF                 ;GET BUFFER ADDRESS FROM COMMAND STRING
74                                                      ;       AND CHECK IT AGAINST THE
75                                                      ;       DEFINITION TABLE.
76 00216 000000G               +BUFRES                 ;RESET BUFFER POINTERS
77 00220 000000G               +SAVER2                 ;SAVE R2 ON THE STACK SINCE IT HAS
78                                                      ;       THE DESCRIPTOR ADDRESS.
79 00222 000000G               +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
80 00224 000000G               +INTST                  ;       AND GET "SC".  INTEGERIZE
81                                                      ;       RESULT AND TEST <=16.
82 00226 000000G               +SAVINT                 ;SAVE INTEGER ON STACK
83 00230 000000G               +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
84 00232 000000G               +INTST                  ;       AND GET "NSC".  INTEGERIZE
85                                                      ;       RESULT AND TEST <=15.
86 00234 000000G               +SAVINT                 ;SAVE INTEGER ON STACK
87 00236 000000G               +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
88 00240 000000G               +INTST                  ;       AND GET "NPTS".  INTEGERIZE
89                                                      ;       RESULT AND TEST <=65535.
90 00242 000000G               +SAVINT                 ;SAVE INTEGER ON STACK
91 00244 000000G               +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
92 00246 000000G               +INTST                  ;       AND GET "MODE".  INTEGERIZE
93                                                      ;       RESULT AND TEST <=17.
94 00250 000252'               .+2                     ;LEAVE POLISH MODE
95 00252 016500                MOV     FAC2(R5),R0     ;GET MODE
         000042
96 00256 010067                MOV     R0,RTSMOD       ;SAVE IT FOR LATER
         177536
97 00262 012667                MOV     (SP)+,RTSNPT    ;GET NPTS FROM STACK
         177524
98 00266 001424                BEQ     RTS00           ;ZERO POINTS MEANS DISABLE SAMPLING
99 00270 012603                MOV     (SP)+,R3        ;GET NSC FROM STACK
100 00272 010367               MOV     R3,RTSNSC       ;SAVE FOR LATER
         177520
101 00276 012667               MOV     (SP)+,RTSSC     ;GET SC FROM STACK
```



```
         177512
102 00302 012602               MOV     (SP)+,R2        ;GET R2 (BUFFER DESCRIPTOR ADDRESS)
103 00304 010267               MOV     R2,RTSBUF
         177500
104 00310 032700               BIT     #4,R0           ;CHECK SC=1+(NSC*DUAL BIT) <= 15
         000004
105 00314 001401               BEQ     RTS01           ;NOT DUAL
106 00316 006303               ASL     R3              ;DUAL BIT SET, NSC = NSC*2
107 00320 005303       RTS01:  DEC     R3              ;NSC = NSC - 1
108 00322 066703               ADD     RTSSC,R3        ;SC = 1 + (NSC*DUAL BIT)
         177466
109 00326 020327               CMP     R3,#15.         ;MUST BE <=15
         000017
110 00332 003405               BLE     RTS02           ;OK
111 00334 000137               JMP     @#ERNOR         ;NUMBER OUT OF RANGE
         000000G
112 00340 062706       RTS00:  ADD     #6,SP           ;CLEAN UP STACK AND EXIT
         000006
113 00344 000524               BR      RTS10
114 00346 012703       RTS02:  MOV     #100,R3         ;R3 WILL END UP HAVING A/D STATUS
         000100
115                                                     ;       REGISTER SETTING.
116 00352 016746               MOV     RTSSC,-(SP)     ;STARTING CHANNEL #
         177436
117 00356 000316               SWAB    (SP)
118 00360 052603               BIS     (SP)+,R3        ;INSERT SC INTO A/D STATUS
119 00362 032700               BIT     #4,R0           ;DUAL SAMPLE AND HOLD?
         000004
120 00366 001402               BEQ     RTS03           ;NO
121 00370 052703               BIS     #40000,R3       ;YES:  INSERT INTO STATUS REG.
         040000
122 00374 032700       RTS03:  BIT     #2,R0           ;CLOCK ENABLE OR ST?
         000002
123 00400 001003               BNE     RTS04           ;CLOCK
124 00402 052703               BIS     #20,R3          ;ST
         000020
125 00406 000402               BR      RTS05
126 00410 052703       RTS04:  BIS     #40,R3          ;CLOCK
         000040
127 00414 006000       RTS05:  ROR     R0              ;NOW GET BURST MODE
128 00416 103002               BCC     RTS06
129 00420 052703               BIS     #10,R3          ;SET BURST MODE BIT IN STATUS REG
         000010
130 00424 032700       RTS06:  BIT     #4,R0           ;DMA REQUESTED?
         000004
131 00430 001444               BEQ     RTS09           ;NO:  STATUS REGISTER OK AS IS THEN
132 00432 005203               INC     R3              ;ADD IN START BIT TO GET THINGS GOING
133                                                     ;       FOR DMA OPERATIONS.
134 00434 011200               MOV     (R2),R0         ;MAKE SURE A/D WON'T OVERRUN
135 00436 066700               ADD     RTSNPT,R0       ;       BUFFER SIZE ALLOCATED.
         177350
136 00442 066700               ADD     RTSNPT,R0
         177344
137 00446 032703               BIT     #40000,R3       ;IF DUAL SAMPLE AND HOLD, DOUBLE
         040000
130                                                     ;       NUMBER OF POINTS.
139 00452 001404               BEQ     RTS07           ;NO
```

```
140 0454 066700          ADD     RTSNPT,R0
         177332
141 0460 066700          ADD     RTSNPT,R0
         177326
142 0464 010067 RTS07:   MOV     R0,RTSEND       ;SAVE END ADDRESS
         177332
143 0470 026200          CMP     END(R2),R0      ;EXCEEDED ARRAY SIZE?
         000002
144 0474 003402          BLE     RTS08           ;NO:  OK THEN
145 0476 000137          JMP     @#ERBUF         ;DMA EXCEEDS BUFFER SIZE
         000000G
146 0502 012700 RTS08:   MOV     #LPSAD,R0       ;SETUP STATUS REGISTER AND DMA
         000000G
147 0506 012704          MOV     #LPSDMA,R4      ;    REGISTER.
         000000G
148 0512 012710          MOV     #6,(R0)         ;NOW SET UP THE DMA
         000006
149 0516 011214          MOV     (R2),(R4)       ;DMA CURRENT ADDRESS
150 0520 012710          MOV     #4,(R0)
         000004
151 0524 016714          MOV     RTSNPT,(R4)     ;DMA WORD COUNT
         177262
152 0530 005414          NEG     (R4)            ;TWO'S COMPLEMENT
153 0532 012710          MOV     #2,(R0)         ;DMA STATUS REGISTER
         000002
154 0536 012714          MOV     #10000,(R4)     ;DMA ENABLE BIT
         010000
155 0542 110337 RTS09:   MOVB    R3,@#RTSON      ;INDICATE AN RTS IS IN PROGRESS
         000000G
156 0546 010367          MOV     R3,RTSCSR       ;SAVE CSR SETTING FOR INTERRUPT HANDLER
         177252
157 0552 010337          MOV     R3,@#LPSAD      ;START UP THE A/D OPERATON
         000000G
158 0556 000137 RTS10:   JMP     @#CKRPAR        ;CHECK LAST TOKEN EQUAL TO A RIGHT
         000000G
159                                              ;    PARENS AND RETURN TO THE BASIC
160                                              ;    INTERPRETER.
161              ;
```

27


```
1                ;       .SBTTL  "LED" COMMAND PROCESSOR
2                ;
3                ;**************************************************************
4                ;
5                ; "LED" COMMAND PROCESSOR
6                ;
7                ; BASIC FORM:   CALL "LED"(VAR)
8                ;
9                ; PURPOSE:  LED WILL DISPLAY THE FLOATING POINT VALUE OF THE
10               ;               VARIABLE "VAR".  UP TO 6 POSITIVE OR 5 NEGATIVE
11               ;               DIGITS CAN BE DISPLAYED IN THE LEDS.  AN OPTIONAL
12               ;               DECIMAL POINT MAY ALSO BE INCLUDED.  NUMBERS WHICH
13               ;               ARE UNABLE TO BE DISPLAYED (VIZ,, "E" NUMBERS AND
14               ;               NEGATIVE 6 DIGITS ONES) ARE SHOWN BY ALL MINUS
15               ;               SIGNS IN THE LEDS.
16               ;
17 00562         LED:                             ;ENTRY POINT TO PROCESSOR
18 00562 004737          JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
         000000G
19                                               ;    FOR ENOUGH AREA TO WORK
20                                               ;    WITH AND THAT FIRST TOKEN
21                                               ;    IS INDEED A LEFT PARENS.
22 00566 000000G         +GETNUM                 ;GET NUMERIC FROM COMMAND ("VAR")
23 00570 000572'         .+2                     ;LEAVE POLISH MODE
24 00572 005067          CLR     CNT             ;CHARACTER COUNTER
         177230
25 00576 012765          MOV     #LEDRES,T3(R5)  ;WHERE RESULTS WILL END UP
         000030'
         000062
26 00604 004737          JSR     PC,@#NUMSGN     ;GENERATE CHARACTER STRING
         000000G
27 00610 000722'         .WORD   LEDOUT          ;ROUTINE TO PROCESS CHARACTERS
28 00612 016500          MOV     T3(R5),R0       ;GET LAST DIGIT POSITION +1
         000062
29 00616 012702          MOV     #LEDRES+6,R2    ;WHERE RESULT WILL END UP +1
         000036'
30 00622 026727 LED1:    CMP     CNT,#6          ;GOOD # GENERATED?
         177200
         000006
31 00630 003010          BGT     LED3            ;NO:  INSERT A "-" SIGN THEN
32 00632 020227 LED2:    CMP     R2,#LEDRES      ;INSERT NEXT CHARACTER IF SPACE IS
         000030'
33                                               ;    AVAILABLE.
34 00636 001413          BEQ     LED5            ;ALL DONE, NOW PUT THEM UP ON THE
35                                               ;    LED'S.
36 00640 020027          CMP     R0,#LEDRES      ;GET NEXT CHARACTER IF ONE EXISTS
         000030'
37 00644 001405          BEQ     LED4            ;NO:  FILL WITH BLANKS THEN
38 00646 114042          MOVB    -(R0),-(R2)     ;COPY ONE CHARACTER OVER
39 00650 000764          BR      LED1            ;WORK ON NEXT CHARACTER
40               ;
41 00652 012700 LED3:    MOV     #MINUS+1,R0     ;INSERT "-" SIGN FOR BAD NUMBER
         000050'
42 00656 000765          BR      LED2
43               ;
44 00660 012700 LED4:    MOV     #BLANK+7,R0     ;INSERT LEADING BLANKS
         000047'
```

```
45 00664 000762          BR      LED2
46                       ;
47 00666 012700 LED5:    MOV     #LEDRES+6,R0    ;WHERE TO START PULLING
         000036'
48 00672 005046          CLR     -(SP)           ;CLEAR LED REGISTER TO START
49 00674 114016 LED6:    MOVB    -(R0),(SP)      ;GET CHARACTER
50 00676 011637          MOV     (SP),@#LPSADB   ;DISPLAY CHAR
         000006G
51 00702 062716          ADD     #400,(SP)       ;POINTS TO NEXT DIGIT POSITION
         000400
52 00706 022716          CMP     #3000,(SP)      ;ALL DONE? (3000=400*6)
         003000
53 00712 002370          BGE     LED6            ;NO:  DO NEXT CHAR
54 00714 005726          TST     (SP)+           ;CLEAN UP STACK
55 00716 000137          JMP     @#CKRPAR        ;CHECK NEXT TOKEN EQUAL TO A RIGHT
         000000G
56                                               ;    PARENS AND RETURN TO THE BASIC
57                                               ;    INTERPRETER.
58                       ;
```

28


```
1                        ;
2                        ; ROUTINE TO SUPPORT LED COMMAND
3                        ;
4 000722                 LEDOUT:
5 000722 122700          CMPB    #'+,R0          ;"+" ?
         000053
6 000726 001421          BEQ     LEDXT           ;YES:  IGNORE
7 000730 122700          CMPB    #' ,R0          ;IGNORE BLANKS ALSO
         000040
8 000734 001416          BEQ     LEDXT
9 000736 122700          CMPB    #'E,R0          ;LETTER E?
         000105
10 00742 001432          BEQ     LEDBAD          ;YES:  CAN'T DISPLAY E NUMBERS
11 00744 122700          CMPB    #'.,R0          ;DECIMAL POINT?
         000056
12 00750 001411          BEQ     LEDOT1          ;YES:  CHECK TO SEE IF ITS THE
13                                               ;    FIRST CHARACTER.
14 00752 042700          BIC     #177760,R0      ;RID GARBAGE
         177760
15 00756 110075 LEDSTO:  MOVB    R0,@T3(R5)      ;SAVE CHARACTER
         000062
16 00762 005265          INC     T3(R5)          ;BUMP TO NEXT POSITION
         000062
17 00766 005267          INC     CNT             ;COUNT IT
         177034
18 00772 000207 LEDXT:   RETURN                  ;RETURN TO CALLER
19                       ;
20 00774 112700 LEDOT1:  MOVB    #20,R0          ;CHANGE CHAR TO LED "."
         000020
21 01000 022765          CMP     #LEDRES,T3(R5)  ;WAS THIS THE FIRST CHARACTER
         000030'
         000062
22                                               ;    RECEIVED?
23 01006 001763          BEQ     LEDSTO          ;YES:  STORE AS SINGLE CHAR
24 01010 005365          DEC     T3(R5)          ;BACK UP 1 CHAR POSITION IN ORDER
         000062
25 01014 152775          BISB    #20,@T3(R5)     ;    TO INSERT THE DECIMAL POINT.
         000020
         000062
26 01022 005265          INC     T3(R5)
         000062
27 01026 000207          RETURN                  ;RETURN TO CALLER
28                       ;
29 01030 012767 LEDBAD:  MOV     #7,CNT          ;INDICATE THAT NUMBER IS TOO LARGE
         000007
         176770
30 01036 000207          RETURN                  ;    TO HANDLE AND RETURN.
31                       ;
```

```
1                       ;       .SBTTL  A/D INTERRUPT PROCESSING ROUTINE
2                       ;
3                       ;*****************************************************************
4                       ;
5                       ; A/D INTERRUPT PROCESSING ROUTINE
6                       ;
7  001040               ADCINT:
8  001040 004737        000000G         JSR     PC,@#REGSAV     ;SAVE R0, R2 AND R3 ON STACK
9  001044 013703        000000G         MOV     @#LPSADB,R3     ;READ IN SAMPLE IN CASE WE
10                                                              ;NEED IT LATER.
11 01050 042737         000040          BIC     #40,@#LPSAD     ;DISABLE "CLOCK OVERFLOW ENABLE"
                        000000G
12 01056 105737         000000G         TSTB    @#RTSON         ;RTS OPERATION IN PROGRESS?
13 01062 001006                         BNE     ADC01           ;YES
14 01064 005037 ADC02:  000000G         CLR     @#LPSAD         ;DISABLE A/D AND EXIT
15 01070 105037         000000G         CLRB    @#RTSON         ;(USED PRIMARILY BY DMA OPERATIONS)
16 01074 000137 ADC09:  000000G         JMP     @#RESTOR        ;RESTORE REGISTERS AND EXIT
17 01100 032767 ADC01:  000010          BIT     #10,RTSMOD      ;DMA REQUEST FINISHED (IF ONE WAS
                        176712
18                                                              ;    PREVIOUSLY STARTED)?
19 01106 001410                         BEQ     ADC03           ;NO
20 01110 016702         176674          MOV     RTSBUF,R2       ;DMA IS DONE, ALLOW ARRAY TO BE
21 01114 016762         176702          MOV     RTSEND,PUT(R2)  ;    ACCESSIBLE.
                        000004
22 01122 011262         000006          MOV     (R2),GET(R2)
23 01126 000756                         BR      ADC02           ;DISABLE A/D AND EXIT
24                      ;
25 01130 016746 ADC03:  176662          MOV     RTSNSC,-(SP)    ;NBR OF POINTS TO PROCESS
26 01134 016702         176650          MOV     RTSBUF,R2       ;WHERE TO STORE RESULTS
27 01140 004737 ADC04:  000000G         JSR     PC,@#STODAT     ;STORE 1ST SAMPLE
28 01144 032767         000004          BIT     #4,RTSMOD       ;DUAL SAMPLE AND HOLD?
                        176646
29 01152 001411                         BEQ     ADC05           ;NO
30 01154 005237         000000G         INC     @#LPSAD         ;YES:  READ IN 2ND SAMPLE AND STORE IT
31 01160 105737 ADC06:  000000G         TSTB    @#LPSAD         ;WAIT FOR IT
32 01164 100375                         BPL     ADC06
33 01166 013703         000000G         MOV     @#LPSADB,R3     ;GET A/D RESULT
34 01172 004737         000000G         JSR     PC,@#STODAT     ;STORE IT
```

29


```
35 01176 005316 ADC05:  DEC     (SP)            ;ALL SAMPLES TAKEN?
36 01200 003411         BLE     ADC07           ;YES:  TERMINATE THIS SET
37 01202 062737         000401  ADD     #401,@#LPSAD    ;GO TO NEXT CHANNEL AND START CONVERSION
                        000000G
38 01210 105737 ADC08:  000000G TSTB    @#LPSAD         ;WAIT FOR IT
39 01214 100375                 BPL     ADC08
40 01216 013703         000000G MOV     @#LPSADB,R3     ;GET RESULT
41 01222 000746                 BR      ADC04           ;STORE IT
42                      ;
43 01224 005726 ADC07:  TST     (SP)+           ;CLEAN UP STACK
44 01226 005367         176560  DEC     RTSNPT          ;ALL POINTS TAKEN?
45 01232 003714                 BLE     ADC02           ;YES:  STOP EVERYTHING THEN
46 01234 016737         176564  MOV     RTSCSR,@#LPSAD  ;RESTORE A/D STATUS REGISTER
                        000000G
47 01242 000714                 BR      ADC09           ;RESTORE G.P. REGISTERS AND EXIT
48                      ;
49                      ;
50       000001'        .END                            ;END OF MODULE #1
```

SYMBOL TABLE

```
ADC     000050RG        ADCINT  001040R         ADC01   001100R
ADC02   001064R         ADC03   001130R         ADC04   001140R
ADC05   001176R         ADC06   001160R         ADC07   001224R
ADC08   001214R         ADC09   001074R         ADC1    000132R
ADC2    000064R         BAD     = 000010        BCDON = ****** G
BEG     = 000000        BLANK   000040R         BUFRES= ****** G
CKCMGN= ****** G        CKCOMA= ****** G        CKRPAR= ****** G
CNT     000026R         CONBCD= ****** G        DEL     = 000012
DRSNPT= ****** G        DRSON = ****** G        END     = 000002
ENTERP= ****** G        ERBUF = ****** G        ERNOR = ****** G
ERRARG= ****** G        ERRPDL= ****** G        ERRSYN= ****** G
EVAL  = ****** G        FAC1  = 000040          FAC2  = 000042
FLOAT = ****** G        GET   = 000006          GETADD= ****** G
GETBUF= ****** G        GETDAT= ****** G        GETNUM= ****** G
GETV  = ****** G        GETVAR= ****** G        HISTON= ****** G
INT   = ****** G        INTST = ****** G        LED     000562RG
LEDBAD  001430R         LEDOT1  000774R         LEDOUT  000722R
LEDRES  000630R         LEDSTO  000756R         LEDXT   000772R
LED1    000622R         LED2    000632R         LED3    000652R
LED4    000660R         LED5    000666R         LED6    000674R
LPSAD = ****** G        LPSADR= ****** G        LPSDMA= ****** G
LPSDR = ****** G        LPSIP = ****** G        LPSIVA= ****** G
MAXA    000000R         MINUS   000047R         NAMRAY= ****** G
NUMSGN= ****** G        PC    =%000007          POLENT= ****** G
POLRET= 000134          PS    = 177776          PUT   = 000004
REGSAV= ****** G        RESTOR= ****** G        RESTR2= ****** G
RETURN= 000207          RTS     000156RG        RTSHUF  002010R
RTSCSR  000024R         RTSEND  000022R         RTSMOD  000020R
RTSNPT  000012R         RTSNSC  000016R         RTSON = ****** G
RTSSC   000014R         RTS00   000340R         RTS01   000320R
RTS02   000346R         RTS03   000374R         RTS04   000410R
RTS05   000414R         RTS06   000424R         RTS07   000464R
RTS08   000502R         RTS09   000542R         RTS10   000556R
R0    =%000000          R1    =%000001          R2    =%000002
R3    =%000003          R4    =%000004          R5    =%000005
SAVEH2= ****** G        SAVFAC= ****** G        SAVINT= ****** G
SP    =%000006          SS1SAV= 000024          SS2SAV= 000026
STODAT= ****** G        STOVXT= ****** G        STOVAR= ****** G
TABLE = ****** G        T3    = 000062          VARSAV= 000022
.COMMA= ****** G        .LPAR = ****** G        .RPAR = ****** G

. ABS.  000000          000
        001244          001
ERRORS DETECTED: 0
FREE CORE: 18459. WORDS

,LP:=LPS1
```

30

```
1               .TITLE  LPS2  V01-01
2               ;.SBTTL LPS MODULE #2
3               ;
4               ; DEC-11-LBEXA-B-LA3    BASIC KERNEL V02-01
5               ;
6               ; COPYRIGHT (C) 1973,1974
7               ;
8               ; DIGITAL EQUIPMENT CORPORATION
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26              ;
27              ; WRITTEN BY:  RICK HULLY        FEB., 1973
28              ;
```



```
1               ;       .SBTTL  CONTENTS OF MODULE #2
2               ;
3               ; THE FOLLOWING COMMAND PROCESSORS EXIST IN THIS MODULE:
4               ;
5               ;       SETR
6               ;       SETC
7               ;       HIST
8               ;       WAIT
9               ;
```

```
1                ;       .SBTTL  PROGRAM GLOBALS
2                ;
3                ; GLOBALS REQUIRED FOR COMMUNICATION WITH THE BASIC
4                ; INTREPRETER.
5                ;
6                        .GLOBL  ERRPDL,ERRSYN,ERRARG
7                        .GLOBL  EVAL,GETVAR,STOVAR
8                        .GLOBL  INT,.COMMA,.RPAR
9                        .GLOBL  NUMSGN,.LPAR,$IR,$MLR
10                       .GLOBL  $POLSH
11               ;
12               ; GLOBALS REQUIRED FOR COMMUNICATIONS WITH THE VARIOUS
13               ; LPS MODULES.
14               ;
15                       .GLOBL  TABLE,NARRAY,FLOAT
16                       .GLOBL  POLENT,GETADD,GETNUM
17                       .GLOBL  CKCMGN,INTST,GETV
18                       .GLOBL  GETBUF,REGSAV,ERNOR
19                       .GLOBL  STORXT,CKRPAR,ERBUF
20                       .GLOBL  CKCOMA,ENTERP,STODAT
21                       .GLOBL  GETDAT,RTSON,DRSON
22                       .GLOBL  SAVER2,SAVFAC,RESTR2
23                       .GLOBL  RESTOR,HISTON,BCDON
24                       .GLOBL  CONBCD,BUFRES,DRSNPT
25                       .GLOBL  SAVINT,DRSBUF
26               ;
27               ; GLOBALS REQUIRED FOR COMMAND PROCESSORS
28               ;
29                       .GLOBL  SETR,SETC,HIST,WAIT
30               ;
31               ; GLOBALS FOR DEVICE ADDRESSES
32               ;
33                       .GLOBL  LPSCKS,LPSPB,LPSDRS,LPSDIB
34               ;
35               ; GLOBALS FOR INTERRUPT PRIORITY AND VECTOR DEFINITION.
36                       .GLOBL CKLIVA,CKLIP
```



```
1                ;       .SBTTL  REGISTER ASSIGNMENTS AND EQUATES
2                ;
3        000000 R0       =       %0
4        000001 R1       =       %1
5        000002 R2       =       %2
6        000003 R3       =       %3
7        000004 R4       =       %4
8        000005 R5       =       %5
9        000006 SP       =       %6
10       000007 PC       =       %7
11               ;
12               ; GENERAL EQUATES
13               ;
14       177776 PS       =       -2              ;PS = PROCESSOR STATUS WORD
15       000207 RETURN   =       207             ;207 = RTS PC
16       000134 POLRET   =       134             ;134 = JMP @(R4)+
17               ;
18               ; BASIC USER'S EQUATES
19               ;
20       000022 VARSAV   =       22              ;VAR SAVE FOR ASSIGNMENT
21       000024 SS1SAV   =       24              ;SS1 SAVE FOR ASSIGNMENT
22       000026 SS2SAV   =       26              ;SS2 SAVE FOR ASSIGNMENT
23       000040 FAC1     =       40              ;HIGH ORDER FLOATING VALUE
24       000042 FAC2     =       42              ;LOW  ORDER FLOATING VALUE
25       000046 R1SAVE   =       46              ;R1 SAVE LOCATION
26       000062 T3       =       62              ;SHORT TERM TEMPORARY
27               ;
28               ; BUFFER DESCRIPTOR EQUATES
29               ;
30       000000 BEG      =       0               ;OFFSET TO BEGINNING OF BUFFER POINTER
31       000002 END      =       2               ;OFFSET TO END OF BUFFER POINTER
32       000004 PUT      =       4               ;OFFSET TO PUT DATA POINTER
33       000006 GET      =       6               ;OFFSET TO GET DATA POINTER
34       000010 BAD      =       10              ;OFFSET TO BAD DATA FLAG
35       000012 DEL      =       12              ;OFFSET TO DISPLAY DELTA X
36               ;
37               ; LIMIT TEST
38               ;
39 00000 000007 MAXC:   .WORD   7               ;7
40 00002 000007         .WORD   7               ;7
41 00004 177777         .WORD   177777          ;65535
42               ;
43               ;
44               ; NON-REENTRANT VARIABLES
45               ;
46 00006 000000 HSTNPT: .WORD   0               ;HIST COMMAND (NBR OF POINTS)
47 00010 000000 HSTBUF: .WORD   0               ;HIST COMMAND (BUFFER DESCRIPTOR
48                                               ;    ADDRESS)
49 00012     000 CKSTFG: .BYTE   0,0             ;CLOCK/ST#1 FLAGS FOR WAIT COMMAND
   00013     000
50               ;
```

```
1                       ;       .SBTTL  "SETR" COMMAND PROCESSOR
2                       ;
3                       ;*****************************************************************
4                       ;
5                       ; "SETR" COMMAND PROCESSOR
6                       ;
7                       ; BASIC FORM:   CALL "SETR"(RATE,MODE,PRESET)
8                       ;
9                       ; PURPOSE:  SET CLOCK RATE WILL SET THE CLOCK RUNNING AT THE
10                      ;               DESIGNATED "RATE" AND IN THE SPECIFIED
11                      ;               "MODE".  THE "PRESET" VALUE IS THE CLOCK COUNTER
12                      ;               VALUE.  THE INTERRUPT ENABLE WILL ALWAYS BE
13                      ;               SET TO A ONE.
14                      ;
15                      ;               VALUES OF "RATE"
16                      ;                 0  NO RATE SELECTED
17                      ;                 1  1 MHZ
18                      ;                 2  100 KHZ
19                      ;                 3  10 KHZ
20                      ;                 4  1 KHZ
21                      ;                 5  100 HZ
22                      ;                 6  SCHMITT TRIGGER #1 (MEANINGFUL ONLY
23                      ;                      FOR HIST OPERATIONS),
24                      ;                 7  LINE FREQUENCY (50 HZ OR 60 HZ)
25                      ;
26                      ;               VALUES OF "MODE"
27                      ;                 0  SINGLE INTERVAL MODE,  COUNTER COUNTS FROM
28                      ;                      PRESET VALUE TO OVERFLOW AND STOPS,
29                      ;                 1  REPEATED INTERVAL MODE,  COUNTER COUNTS FROM
30                      ;                      PRESET VALUE TO OVERFLOW, TRANSFERS
31                      ;                      BUFFER/PRESET TO COUNTER, AND BEGINS
32                      ;                      AGAIN,
33                      ;                 2  EXTERNAL EVENT TIMING MODE,  THE COUNTER IS
34                      ;                      FREE RUNNING, AND A PULSE FROM ST #2 WILL
35                      ;                      TRANSFER CONTENTS OF COUNTER TO BUFFER/
36                      ;                      PRESET AND THEN CONTINUE COUNTING,
37                      ;                 3  EVENT TIMING FROM ZERO BASE MODE IS THE
38                      ;                      SAME EXCEPT THAT WHEN THE TRANSFER OF THE
39                      ;                      COUNTER TO THE BUFFER/PRESET IS DONE,
40                      ;                      THE COUNTER IS CLEARED AND THE COUNT BEGINS
41                      ;                      FROM ZERO,
42                      ;               MODE+4  START CLOCK ONLY WHEN ST#1 FIRES,
43                      ;
44 00014                SETR:                           ;ENTRY POINT TO PROCESSOR
45 00014 012737         MOV     #CKLINT,@#CKLIVA        ;INTERRUPT ENTRY POINT,
         000540'
         000000G
46 00022 012737         MOV     #240,@#CKLIP            ;PROCESSOR PRIORITY,
         000240
         000000G
47 00030 012765         MOV     #MAXC,T3(R5)    ;FOR LIMIT TESTS ON RATE, MODE, AND
         000000'
         000062
48                                              ;       AND PRESET,
49 00036 004737         JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
         000000G
50                                              ;       FOR ENOUGH AREA TO WORK
```



```
51                                              ;       WITH AND THAT FIRST TOKEN
52                                              ;       IS INDEED A LEFT PARENS,
53 00042 000000G        +GETNUM                 ;GET "RATE" IN COMMAND
54 00044 000000G        +INTST                  ;INTEGERIZE IT AND TEST <=7
55 00046 000000G        +SAVINT                 ;SAVE IN ON THE STACK
56 00050 000000G        +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
57                                              ;       AND GET NEXT NUMERIC ("MODE")
58 00052 000000G        +INTST                  ;INTEGERIZE IT AND TEST <=7
59 00054 000000G        +SAVINT                 ;SAVE RESULT ON THE STACK,
60 00056 000000G        +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
61 00060 000000G        +INTST                  ;       GET NEXT NUMERIC, AND TEST <=65535,
62 00062 000064'        .+2                     ;LEAVE POLISH MODE
63 00064 005037         CLR     @#LPSCKS        ;TURN OFF CLOCK MOMENTARILY
         000000G
64 00070 005465         NEG     FAC2(R5)        ;TAKE TWO'S COMPLEMENT OF THE PRESET
         000042
65 00074 016537         MOV     FAC2(R5),@#LPSPB ;      VALUE AND ENTER INTO THE BUFFER
         000042
         000000G
66                                              ;       PRESET REGISTER,
67 00102 012600         MOV     (SP)+,R0        ;GET MODE
68 00104 012602         MOV     (SP)+,R2        ;GET RATE
69 00106 006302         ASL     R2              ;NORMALIZE TO BITS 01-03 OF WORD
70 00110 000300         SWAB    R0              ;PUT MODE IN LEFT BYTE
71 00112 052700         BIS     #101,R0         ;ASSUME NO ST#1 CLOCK STARTS
         000101
72 00116 032700         BIT     #2000,R0        ;ST #1 REQUESTED?
         002000
73 00122 001404         BEQ     SETR1           ;NO
74 00124 042700         BIC     #2001,R0        ;CLEAR OUT ST BIT AND START BIT
         002001
75 00130 052700         BIS     #20000,R0       ;ADD IN REAL ST BIT IN STATUS REGISTER
         020000
76 00134                SETR1:
77 00134 105067         CLRB    CKSTFG          ;CLEAR CLOCK FLAG BEFORE STARTING
         177652
78 00140 050002         BIS     R0,R2           ;COMBINE MODE + RATE + ST#1 + START
79 00142 010237         MOV     R2,@#LPSCKS     ;NOW START UP CLOCK
         000000G
80 00146 000137         JMP     @#CKRPAR        ;CHECK LAST TOKEN EQUAL TO A RIGHT
         000000G
81                                              ;       PARENS AND RETURN TO THE BASIC
82                                              ;       INTERPRETER,
83                      ;
```

```
                        ;       .SBTTL  "SETC" COMMAND PROCESSOR
                        ;
                        ;*****************************************************************
                        ;
                        ; "SETC" COMMAND PROCESSOR
                        ;
                        ; BASIC FORM:   CALL "SETC"(RATE,TIME)
                        ;
                        ; PURPOSE:  SET CLOCK TO THAT SPECIFIED BY "RATE" AND "TIME",
                        ;               THE CLOCK STATUS REGISTER IS SET TO "RATE" AND
                        ;               WILL RUN FOR "TIME" SECONDS.  A CLOCK INTERRUPT
                        ;               WILL THEN OCCUR WHICH MAY BE USED TO INITIATE
                        ;               ANY OF THE CLOCK CONTROLLED FUNCTIONS.  THE
                        ;               TIME ARGUMENT IS EVALUATED AS TICKS = TIME IN SECS
                        ;               TIMES CLOCK RATE SPECIFIED IN "RATE", E.G. IF
                        ;               CLOCK RATE WAS 10KHZ, THEN TICKS = TIME IN SECONDS
                        ;               TIMES 10KHZ.  THE "TICKS" ARE ENTERED INTO
                        ;               THE CLOCK PRESET/BUFFER REGISTER.  THE CLOCK
                        ;               ALWAYS RUNS IN MODE ZERO.
                        ;
                        ;               LEGAL VALUES OF RATE ARE:  4, 5, AND 7 (SEE SETR
                        ;               FOR EXPLANATION OF MODES).
                        ;
000152                  SETC:                           ;ENTRY POINT TO PROCESSOR
000152 012737           MOV     #CKLINT,@#CKLIVA
000540'
000060G
000160 012737           MOV     #240,@#CKLIP
000240
000060G
000166 012765           MOV     #MAXC+2,T3(R5)  ;LIMIT TESTING OF "RATE" AND "TIME"
000002'
000062
000174 004737           JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
000000G
                                                ;       FOR ENOUGH AREA TO WORK
                                                ;       WITH AND THAT FIRST TOKEN
                                                ;       IS INDEED A LEFT PARENS.
000200 000000G          +GETNUM                 ;GET "RATE" FROM COMMAND
000202 000000G          +INTST                  ;INTEGERIZE AND TEST <= 7
000204 000000G          +SAVINT                 ;SAVE RATE ON STACK
000206 000000G          +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A
                                                ;       COMMA AND GET NEXT NUMERIC
                                                ;       FROM COMMAND STRING.  ("TIME").
000210 000212'          .+2                     ;EXIT POLISH MODE
000212 010165           MOV     R1,R1SAVE(R5)   ;PERSERVE R1
000046
000216 005037           CLR     @#LPSCKS        ;TURN OFF CLOCK MOMENTARILY
000000G
000222 021627           CMP     (SP),#4         ;RATE MUST BE MODES 4,5, OR 7
000004
000226 002451           BLT     ERARG           ;ILLEGAL RATE SPECIFIED
000230 021627           CMP     (SP),#6         ;RATE OF 6 IS ALSO ILLEGAL
000006
000234 001446           BEQ     ERARG
000236 006316           ASL     (SP)            ;RATE = RATE * 2  (TO POSITION IN PLACE
                                                ;       FOR THE CLOCK STATUS REGISTER).
```



```
000240 011602           MOV     (SP),R2         ;CONVERT CODE TO A FLOATING POINT NUMBER
000242 005046           CLR     -(SP)           ;2ND HALF OF FP# IS ALWAYS ZERO
000244 016246           MOV     FPNBR-10(R2),-(SP)
000346'
000250 016546           MOV     FAC2(R5),-(SP)  ;PUT "TIME" ON STACK
000042
000254 016546           MOV     FAC1(R5),-(SP)
000040
000260 001005           BNE     SETC1           ;TIME IS ALREADY FLOATED
000262 005726           TST     (SP)+           ;FLOAT "TIME"
000264 004437           JSR     R4,@#$POLSH
000000G
000270 000000G          +$IR
000272 000274'          .+2                     ;EXIT POLISH MODE
000274 004437 SETC1:    JSR     R4,@#$POLSH
000000G
000300 000000G          +$MLR                   ;MULTIPLY "TIME" * "RATE"
000302 000304'          .+2                     ;EXIT POLISH MODE
000304 012665           MOV     (SP)+,FAC1(R5)  ;PUT RESULT IN FAC
000040
000310 012665           MOV     (SP)+,FAC2(R5)
000042
000314 004737           JSR     PC,@#ENTERP
000000G
000320 000000G          +INTST                  ;INTERGIZE AND NEGATE NUMBER
000322 005465           NEG     FAC2(R5)
000042
000326 016537           MOV     FAC2(R5),@#LPSPB ;PUT INTO BLOCK BUFFER/PRESET
000042
000000G
                                                ;       REGISTER.
000334 012602           MOV     (SP)+,R2        ;GET "RATE"
000336 012700           MOV     #101,R0         ;CLOCK + INTERRUPT ENABLE BITS
000101
000342 016501           MOV     R1SAVE(R5),R1   ;RESTORE R1
000046
000346 000167           JMP     SETR1           ;START UP CLOCK AND CHECK LAST
177562
                                                ;       TOKEN EQUAL TO A RIGHT PARENS.
                                                ;       THEN RETURN TO THE BASIC
                                                ;       INTERPRETER.
                        ;
000352 000137 ERARG:    JMP     @#ERRARG        ;ILLEGAL ARGUMENT
000000G
                        ;
000356 042572 FPNBR:    .WORD   042572          ;FLOATING POINT 1000
000360 041710           .WORD   041710          ;FLOATING POINT 100
000362 000000           .WORD   0               ;FLOATING POINT 0
                        .IFNDF  CYC50
000364 041510           .WORD   041510          ;FLOATING POINT 60
                        .ENDC
                        .IFDF   CYC50
                        .WORD   041500          ;FLOATING POINT 50
                        .ENDC
                        ;
```

```
                        ;       .SBTTL  "HIST" COMMAND PROCESSOR
                        ;
                        ;*****************************************************************
                        ;
                        ; "HIST" COMMAND PROCESSOR"
                        ;
                        ; BASIC FORM:   CALL "HIST"(BUF,NPTS)
                        ;
                        ; PURPOSE:  HISTOGRAM - TIMED SCHMITT TRIGGER.  THE HIST FUNCTION
                        ;               INPUTS "NPTS" VALUES FROM THE CLOCK PRESET/BUFFER
                        ;               INTO THE SPECIFIED BUFFER, BUF, WHEN ST #2 FIRES.
                        ;               THE CLOCK MODE MUST BE PUT IN 2 OR 3 TO BE MEANINGFUL.
                        ;               THE RDB FUNCTION IS USED TO RETRIEVE THE DATA.
                        ;               THE BUFFER IS ALWAYS CIRCULAR AND THE DATA POINTERS
                        ;               INITIALLY RESET BEFORE THE SAMPLING BEGINS.
                        ;
00366                   HIST:                           ;ENTRY POINT TO PROCESSOR
00366 012765            MOV     #MAXC+4,T3(R5)  ;FOR LIMIT CHECKS ON NPTS
      000004'
      000062
00374 105067            CLRB    HISTON          ;TURN OFF ANY PREVIOUSLY INITIATED
      000000G
                                                ;       HISTOGRAM SAMPLING.
00400 004737            JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
      000000G
                                                ;       FOR ENOUGH AREA TO WORK
                                                ;       WITH AND THAT FIRST TOKEN
                                                ;       IS INDEED A LEFT PARENS.
00404 000000G           +GETBUF                 ;GET BUFFER ADDRESS FROM COMMAND
                                                ;       AND CHECK IT AGAINST THE
                                                ;       DEFINITION TABLE.
00406 000000G           +BUFRES                 ;RESET BUFFER POINTERS
00410 000000G           +SAVER2                 ;SAVE BUFFER ADDRESS
00412 000000G           +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
                                                ;       AND THE NEXT NUMERIC FROM
                                                ;       FROM THE COMMAND, ("NPTS")
00414 000000G           +INTST                  ;INTERGIZE RESULT AND TEST <=65535
00416 000420'           .+2                     ;LEAVE POLISH MODE
00420 016567            MOV     FAC2(R5),HSTNPT ;SAVE "NPTS"
      000042
      177360
00426 012667            MOV     (SP)+,HSTBUF    ;GET BUFFER DESCRIPTOR ADDRESS
      177356
00432 105267            INCB    HISTON          ;ARM TIMED SAMPLING
      000000G
00436 000137            JMP     @#CKRPAR        ;CHECK NEXT TOKEN EQUAL TO RIGHT
      000000G
                                                ;       PARENS AND RETURN TO THE
                                                ;       BASIC INTERPRETER.
                        ;
```



```
                        ;       .SBTTL  "WAIT" COMMAND PROCESSOR
                        ;
                        ;*****************************************************************
                        ;
                        ; "WAIT" COMMAND PROCESSOR
                        ;
                        ; BASIC FORM:   CALL "WAIT"(N)
                        ;
                        ; PURPOSE:  DISABLE FURTHER PROGRAM EXECUTION AND WAIT UNTIL
                        ;               THE SPECIFIED EVENT "N" OCCURS.  "N" IS DEFINED
                        ;               AS FOLLOWS:
                        ;
                        ;               N=0     WAIT FOR CLOCK OVERFLOW
                        ;               N=1     WAIT FOR ST #1 TO FIRE
                        ;               N=2     WAIT FOR N=0 OR N=1
                        ;               N=0,1,2 RETURNS IMMEDIATELY
                        ;
00442                   WAIT:                           ;ENTRY POINT TO PROCESSOR
00442 012765            MOV     #MAXC+4,T3(R5)  ;FOR LIMIT TESTS ON N
      000004'
      000062
00450 004737            JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
      000000G
                                                ;       FOR ENOUGH AREA TO WORK
                                                ;       WITH AND THAT FIRST TOKEN
                                                ;       IS INDEED A LEFT PARENS.
00454 000000G           +GETNUM                 ;GET "N"
00456 000000G           +INTST                  ;INTEGERIZE IT
00460 000462'           .+2                     ;LEAVE POLISH MODE
00462 026527            CMP     FAC2(R5),#2     ;N>2 ALWAYS RETURNS IMMEDIATELY
      000042
      000002
00470 101015            BHI     WAIT4
00472 012702            MOV     #CKSTFG,R2      ;ADDRESS OF CLOCK/ST FLAG
      000012'
00476 016500            MOV     FAC2(R5),R0     ;GET "N"
      000042
00502 001412            BEQ     WAIT1           ;N=1 MEANS CLOCK OVERFLOW
00504 005202            INC     R2              ;ASSUME ST FOR NOW
00506 006000            ROR     R0              ;N=1 MEANS ST OVERFLOW
00510 103407            BCS     WAIT1
00512 005767 WAIT3:     TST     CKSTFG          ;N=2 MEANS ST OR CLOCK OVERFLOW
      177274
00516 001775            BEQ     WAIT3
00520 005067            CLR     CKSTFG          ;CLEAR ALL FLAGS NOW
      177266
00524 000137 WAIT4:     JMP     @#CKRPAR        ;CHECK NEXT TOKEN EQUAL TO A
      000000G
                                                ;       RIGHT PARENS AND RETURN TO
                                                ;       THE BASIC INTERPRETER.
00530 105712 WAIT1:     TSTB    (R2)            ;WAIT FOR SPECIFIED FLAG ONLY
00532 001776            BEQ     WAIT1
00534 105012            CLRB    (R2)            ;CLEAR FLAG FOR NEXT TIME
00536 000772            BR      WAIT4
                        ;
```

```
                        ;       .SBTTL  LPS CLOCK INTERRUPT ROUTINE
                        ;
                        ;*****************************************************************
                        ;
                        ; LPS CLOCK INTERRUPT ROUTINE
                        ;
000540                  CKLINT:
000540 004737           JSR     PC,@#REGSAV     ;SAVE R0, R2, AND R3 ON STACK
        000000G
000544 012700           MOV     #CKSTFG,R0      ;SET ST/CLOCK FLAG
        000012'
000550 105737           TSTB    @#LPSCKS        ;WAS THIS A CLOCK OVERFLOW?
        000000G
000554 100401           BMI     CLK0            ;YES:  SET CLOCK FLAG
000556 005200           INC     R0              ;SET ST FLAG
000560 152710 CLK0:     BISB    #1,(R0)         ;SET APPROPRIATE FLAG
        000001
000564 032737           BIT     #1400,@#LPSCKS  ;MODE ZERO OPERATION?
        001400
        000000G
000572 001003           BNE     CLK4            ;NO
000574 042737           BIC     #1717,@#LPSCKS  ;YES:  DISABLE CLOCK THEN
        001717
        000000G
000602 105767 CLK4:     TSTB    HISTON          ;HIST OPERATION IN PROGRESS?
        000000G
000606 001413           BEQ     CLK1            ;NO:  TEST DRS THEN
000610 013703           MOV     @#LPSPB,R3      ;READ PRESET/BUFFER REGISTER
        000000G
000614 016702           MOV     HSTBUF,R2       ;GET HIST BUFFER ADDRESS
        177170
000620 004737           JSR     PC,@#STODAT     ;STORE DATA IN USER'S BUFFER
        000000G
000624 005367           DEC     HSTNPT          ;ALL POINTS TAKEN?
        177156
000630 001002           BNE     CLK1            ;NO
000632 105067           CLRB    HISTON          ;CLEAR HIST DONE FLAG
        000000G
000636 105737 CLK1:     TSTB    @#DRSON         ;DRS OPERATON IN PROGRESS?
        000000G
000642 100023           BPL     CLK2            ;NO:  EXIT
000644 052737           BIS     #2,@#LPSDRS     ;READ DIGITAL INPUT REGISTER
        000002
        000000G
000652 013703           MOV     @#LPSDIB,R3
        000000G
000656 105737           TSTB    @#BCDON         ;CONVERT TO BCD?
        000000G
000662 001002           BNE     CLK3            ;NO:  TREAT AS A PURE BINARY NUMBER
000664 004737           JSR     PC,@#CONBCD     ;CONVERT TO BCD
        000000G
000670 013702 CLK3:     MOV     @#DRSBUF,R2     ;GET DRS BUFFER ADDRESS
        000000G
000674 004737           JSR     PC,@#STODAT     ;STORE DATA IN USER'S BUFFER
        000000G
000700 005337           DEC     @#DRSNPT        ;ALL POINTS TAKEN
        000000G
```



```
000704 001002           BNE     CLK2            ;NO
000706 105037           CLRB    @#DRSON         ;CLEAR DRS DONE FLAG
        000000G
000712 000137 CLK2:     JMP     @#RESTOR        ;RESTORE REGISTERS AND EXIT
        000000G
                        ;
000001'                 .END                    ;END OF MODULE #2
```

```
LPS2  V01-01    RT-11 MACRO VM02-09   16-OCT-74 02:00:36 PAGE 9+
SYMBOL TABLE

BAD    = 000010          BCDON = ****** G        BEG    = 000000
BUFRES= ****** G         CKCMGN= ****** G        CKCOMA= ****** G
CKLINT  000540R          CKLIP = ****** G        CKLIVA= ****** G
CKRPAR= ****** G         CKSTFG  000012R         CLK0    000560R
CLK1    000636R          CLK2    000712R         CLK3    000670R
CLK4    000602R          CONBCD= ****** G        DEL    = 000012
DRSBUF= ****** G         DRSNPT= ****** G        DRSON = ****** G
END    = 000002          ENTERP= ****** G        ERARG   000352R
ERBUF = ****** G         ERNOR = ****** G        ERRARG= ****** G
ERRPDL= ****** G         ERR3YN= ****** G        EVAL   = ****** G
FAC1   = 000040          FAC2   = 000042         FLOAT = ****** G
FPNBR   000356R          GET    = 000006         GETADD= ****** G
GETBUF= ****** G         GETDAT= ****** G        GETNUM= ****** G
GETV   = ****** G        GETVAR= ****** G        HIST    000366RG
HISTON= ****** G         HSTBUF  000010R         HSTNPT  000006R
INT    = ****** G        INTST = ****** G        LPSCKS= ****** G
LPSDI8= ****** G         LPSDRS= ****** G        LPSPB = ****** G
MAXC    000000R          NARRAY= ****** G        NUMSGN= ****** G
PC     =%000007          POLENT= ****** G        POLRET= 000134
PS     = 177776          PUT    = 000004         REGSAV= ****** G
RESTOR= ****** G         RESTR2= ****** G        RETURN= 000207
RTSON = ****** G         R0     =%000000         R1     =%000001
R1SAVE= 000046           R2     =%000002         R3     =%000003
R4     =%000004          R5     =%000005         SAVER2= ****** G
SAVFAC= ****** G         SAVINT= ****** G        SETC    000152RG
SETC1   000274R          SETR    000014RG        SETR1   000134R
SP     =%000006          SS1SAV= 000024          SS2SAV= 000026
STODAT= ****** G         STORXT= ****** G        STOVAR= ****** G
TABLE = ****** G         T3     = 000062         VARSAV= 000022
WAIT    000442RG         WAIT1   000530R         WAIT3   000512R
WAIT4   000524R          $IR    = ****** G       $MLR   = ****** G
$POL3H= ****** G         .COMMA= ****** G        .LPAR = ****** G
.RPAR = ****** G
. ABS.  000000     000
        000716     001
ERRORS DETECTED: 0
FREE CORE: 18167. WORDS

.LP1=LPS2
```

```
LPS3  V01-01    RT-11 MACRO VM02-09   16-OCT-74 02:02:11 PAGE 1


1               .TITLE  LPS3  V01-01
2               ;.SBTTL LPS MODULE #3
3               ;
4               ; DEC-11-L8EXA-B-LA4    BASIC KERNEL V02-01
5               ;
6               ; COPYRIGHT (C) 1973,1974
7               ;
8               ; DIGITAL EQUIPMENT CORPORATION
9               ; MAYNARD, MASSACHUSETTS 01754
10              ;
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27              ; WRITTEN BY:  RICK HULLY       FEB., 1973
28              ;
```

```
1               ;       .SBTTL  CONTENTS OF MODULE #3
2               ;
3               ; THE FOLLOWING COMMAND PROCESSORS EXIST IN THIS MODULE:
4               ;
5               ;       DIR
6               ;       DOR
7               ;       DRS
8               ;       REL
9               ;
```



```
1               ;       .SBTTL  PROGRAM GLOBALS
2               ;
3               ; GLOBALS REQUIRED FOR COMMUNICATION WITH THE BASIC
4               ; INTREPRETER.
5               ;
6                       .GLOBL  ERRPDL,ERRSYN,ERRARG
7                       .GLOBL  EVAL,GETVAR,STOVAR
8                       .GLOBL  INT,,COMMA,,RPAR
9                       .GLOBL  NUMSGN,,LPAR
10              ;
11              ; GLOBALS REQUIRED FOR COMMUNICATIONS WITH THE VARIOUS
12              ; LPS MODULES.
13              ;
14                      .GLOBL  TABLE,NARRAY,FLOAT
15                      .GLOBL  POLENT,GETADD,GETNUM
16                      .GLOBL  CKCMGN,INTST,GETV
17                      .GLOBL  GETBUF,REGSAV,ERNOR
18                      .GLOBL  STORXT,CKRPAR,ERBUF
19                      .GLOBL  CKCOMA,ENTERP,STODAT
20                      .GLOBL  GETDAT,RTSON,DRSON
21                      .GLOBL  SAVER2,SAVFAC,RESTR2
22                      .GLOBL  RESTOR,HISTON,BCDON
23                      .GLOBL  CONBCD,BUFRES,DRSNPT
24                      .GLOBL  SAVINT,DRSBUF
25              ;
26              ; GLOBALS REQUIRED FOR COMMAND PROCESSORS
27              ;
28                      .GLOBL  DIR,DOR,DRS,REL
29              ;
30              ; GLOBALS FOR DEVICE ADDRESSES
31              ;
32                      .GLOBL  LPSDRS,LPSDIB,LPSDOR
33              ;
34              ; GLOBALS FOR INTERRUPT PRIORITY AND VECTOR ADRESS.
35                      .GLOBL DRSIVA,DRSIP
```

```
                        ;       .SBTTL  REGISTER ASSIGNMENTS AND EQUATES
                        ;
000000 R0       =       %0
000001 R1       =       %1
000002 R2       =       %2
000003 R3       =       %3
000004 R4       =       %4
000005 R5       =       %5
000006 SP       =       %6
000007 PC       =       %7
                        ;
                        ; GENERAL EQUATES
                        ;
177776 PS       =       =2              ;PS = PROCESSOR STATUS WORD
000207 RETURN   =       207             ;207 = RTS PC
000134 POLRET   =       134             ;134 = JMP @(R4)+
                        ;
                        ; BASIC USER'S EQUATES
                        ;
000022 VARSAV   =       22              ;VAR SAVE FOR ASSIGNMENT
000024 SS1SAV   =       24              ;SS1 SAVE FOR ASSIGNMENT
000026 SS2SAV   =       26              ;SS2 SAVE FOR ASSIGNMENT
000040 FAC1     =       40              ;HIGH ORDER FLOATING VALUE
000042 FAC2     =       42              ;LOW  ORDER FLOATING VALUE
000056 T1       =       56              ;SHORT TERM TEMPORARY
000060 T2       =       60              ;SHORT TERM TEMPORARY
000062 T3       =       62              ;SHORT TERM TEMPORARY
                        ;
                        ; BUFFER DESCRIPTOR EQUATES
                        ;
000000 BEG      =       0               ;OFFSET TO BEGINNING OF BUFFER POINTER
000002 END      =       2               ;OFFSET TO END OF BUFFER POINTER
000004 PUT      =       4               ;OFFSET TO PUT DATA POINTER
000006 GET      =       6               ;OFFSET TO GET DATA POINTER
000010 BAD      =       10              ;OFFSET TO BAD DATA FLAG
000012 DEL      =       12              ;OFFSET TO DISPLAY DELTA X
                        ;
                        ; LIMIT TEST
                        ;
00000 177777 MAXD:      .WORD   177777          ;65535
00002 000002 MAXR:      .WORD   2               ;2
                        ;
```



```
                        ;       .SBTTL  "DIR" COMMAND PROCESSOR
                        ;
                        ;*****************************************************************
                        ;
                        ; "DIR" COMMAND PROCESSOR
                        ;
                        ; BASIC FORM:   CALL "DIR"(N,VAR,NEWCSR)
                        ;
                        ;PURPOSE:  READ DIGITAL INPUT REGISTER.  IF N=0, INPUT IS
                        ;               FOUR BCD DIGITS CONVERTED TO FLOATING POINT.
                        ;               IF N#0, THEN THE BINARY RESULT READ FROM THE
                        ;               REGISTER IS DIRECTLY CONVERTED TO A FLOATING
                        ;               POINT NUMBER.  THE REGISTER READ IS ACCOM-
                        ;               PLISHED VIA AN "INTERNAL LOAD" REQUEST AND
                        ;               DOES NOT RESPOND TO INTERRUPTS.  THE RESULT IS
                        ;               PLACED IN "VAR", WHERE 0 <= VAR <= 65535,
                        ;
                        ;               THE NEW CSR REGISTER SETTING IS RETURNED IN NEWCSR.
                        ;
00004                   DIR:                            ;ENTRY POINT TO PROCESSOR
00004 004737 004737             JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
      000000G
                                                        ;    FOR ENOUGH AREA TO WORK
                                                        ;    WITH AND THAT FIRST TOKEN
                                                        ;    IS INDEED A LEFT PARENS.
00010 000000G           +GETNUM                         ;GET "N" IN COMMAND
00012 000000G           +SAVFAC                         ;SAVE FAC ON STACK
00014 000000G           +CKCOMA                         ;CHECK NEXT TOKEN EQUAL TO A COMMA
00016 000000G           +GETV                           ;CALCULATE ADDRESS OF "VAR"
00020 000000G           +CKCOMA                         ;CHECK NEXT TOKEN EQUAL TO A COMMA
00022 000024'           .+2                             ;LEAVE POLISH MODE
00024 052737            BIS     #2,@#LPSDRS     ;ISSUE AN INPUT LOAD COMMAND
      000002
      000000G
00032 013703            MOV     @#LPSDIB,R3     ;READ DIGITAL INPUT REGISTER
      000000G
00036 052626            BIS     (SP)+,(SP)+     ;WAS N=0? (I.E. READ BCD?)
00040 001002            BNE     DIR1            ;NO:  READ STRAIGHT BINARY
00042 004767            JSR     PC,CONBCD       ;CONVERT BCD TO BINARY
      000000G
00046 004737 DIR1:      JSR     PC,@#FLOAT      ;FLOAT RESULT
      000000G
00052 004737            JSR     PC,@#STOVAR     ;STORE RESULT IN "VAR"
      000000G
00056 004737            JSR     PC,@#ENTERP     ;GET ADDRESS WHERE STATUS REGISTER
      000000G
00062 000000G           +GETV                           ;    WILL END UP.
00064                DIR2:
00064 013703            MOV     @#LPSDRS,R3     ;GET STATUS REGISTER
      000000G
00070                DIR3:
00070 004737            JSR     PC,@#FLOAT      ;FLOAT IT
      000000G
00074 000137            JMP     @#STORXT        ;STORE RESULT, CHECK LAST TOKEN EQUAL
      000000G
                                                        ;    TO A RIGHT PARENS AND RETURN
                                                        ;    TO THE BASIC INTERPRETER.
```

```
47                ;
```



```
1                 ;       .SBTTL  "DOR" COMMAND PROCESSOR
2                 ;
3                 ;**********************************************************************
4                 ;
5                 ; "DOR" COMMAND PROCESSOR
6                 ;
7                 ; BASIC FORM:   CALL "DOR"(M,N,NEWDOR)
8                 ;
9                 ; PURPOSE:  WRITE DIGITAL OUTPUT REGISTER.  SELECTED BITS IN
10                ;               THE REGISTER MAY BE SET OR CLEARED.  IF M=0, SET
11                ;               BITS IN REGISTER.  IF M#0, CLEAR BITS IN
12                ;               REGISTER.  "N" IS THE BIT PATTERN TO SET OR CLEAR.
13                ;               THE NEW RESULT IN THE REGISTER IS RETURNED AS A
14                ;               FLOATING POINT NUMBER IN NEWDOR.
15                ;
16 00100          DOR:                                    ;ENTRY POINT TO PROCESSOR
17 00100 012765   000000'         MOV     #MAXD,T3(R5)    ;FOR LIMIT TEST OF "N"
         000062
18 00106 004737   000000G         JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
19                                                        ;    FOR ENOUGH AREA TO WORK
20                                                        ;    WITH AND THAT FIRST TOKEN
21                                                        ;    IS INDEED A LEFT PARENS,
22 00112 000000G                  +GETNUM                 ;GET "M" IN COMMAND
23 00114 000000G                  +SAVFAC                 ;SAVE FAC ON STACK
24 00116 000000G                  +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A
25 00120 000000G                  +INTST                  ;    COMMA AND GET "N" IN COMMAND,
26                                                        ;    INTEGERIZE RESULT AND TEST
27                                                        ;    <65535.
28 00122 000000G                  +CKCOMA                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
29 00124 000126'                  .+2                     ;LEAVE IN POLISH MODE
30 00126 016503   000042          MOV     FAC2(R5),R3     ;GET "N"
31 00132 052626                   BIS     (SP)+,(SP)+     ;M=0? (I.E. SET BITS IN REGISTER?)
32 00134 001003                   BNE     DOR1            ;BNE MEANS CLEAR BITS
33 00136 050337   000000G         BIS     R3,@#LPSDOR     ;BEQ MEANS SET BITS
34 00142 000402                   BR      DOR2
35 00144 040337   000000G DOR1:   BIC     R3,@#LPSDOR     ;CLEAR BITS
36 00150 004737   000000G DOR2:   JSR     PC,@#ENTERP     ;GET ADDRESS OF NEWDOR
37 00154 000000G                  +GETV
38 00156 013703   000000G         MOV     @#LPSDOR,R3     ;RETURN NEW OUTPUT REGISTER SETTING
39 00162 000167   177702          JMP     DIR3            ;    AND CLEANUP.
40                ;
```

40

```
1                       ;       .SBTTL  "DRS" COMMAND PROCESSOR
2                       ;
3                       ;*****************************************************************
4                       ;
5                       ; "DRS" COMMAND PROCESSOR
6                       ;
7                       ; BASIC FORM:   CALL "DRS"(BUF,MODE,NPTS,M,NEWCSR)
8                       ;
9                       ; PURPOSE:  DIGITAL READOUT SAMPLING.  SAMPLES THE DIGITAL
10                      ;               INPUT REGISTER IN A SIMILAR FASHION AS THE
11                      ;               RTS FUNCTION,  WHEN M#0, EACH TIME THE CLOCK
12                      ;               FIRES (OR ST, WHICH CAN TRIGGER THE CLOCK),
13                      ;               THE DIGITAL INPUT REGISTER IS READ, POSSIBLY
14                      ;               CONVERTED FROM BCD TO BINARY (DEPENDING ON THE
15                      ;               "MODE"), AND STORED IN THE CIRCULAR BUFFER BUF.
16                      ;               THE CIRCULAR BUFFER POINTERS ARE INITIALLY RESET
17                      ;               BEFORE THE SAMPLING OPERATION BEGINS.
18                      ;
19                      ;               IF THE DRS IS NOT CLOCK DRIVEN, M<>0, IT MAY BE
20                      ;               DRIVEN BY DIGITAL INPUTS, I.E. WHENEVER A NEW
21                      ;               VALUE IS RECEIVED BY THE INPUT REGISTER, THE VALUE
22                      ;               IS READ AND STORED IN THE BUFFER BUF.
23                      ;
24                      ;               IF THE "MODE"=0, THEN READ BCD OTHERWISE READ BINARY
25                      ;               DIRECTLY.  IF "NPTS" IS GIVEN AS ZERO, DISABLE
26                      ;               THE SAMPLING.
27                      ;
28                      ;               THE NEW SETTING OF THE DIGITAL CONTROL STATUS
29                      ;               REGISTER IS RETURNED IN NEWCSR.
30                      ;
31 00166               DRS:                             ;ENTRY POINT TO PROCESSOR
32 00166 012737  MOV    #DRSINT,@#DRSIVA        ;INT. ENTRY POINT.
         000446'
         000000G
33 00174 012737  MOV    #200,@#DRSIP            ;AND PRIORITY.
         000200
         000000G
34 00202 012765  MOV    #MAXD,T3(R5)    ;FOR LIMIT CHECKS ON "NPTS"
         000000'
         000062
35 00210 105037  CLRB   @#DRSON          ;STOP ANY PREVIOUS DRS OPERATION
         000000G
36 00214 042737  BIC    #100,@#LPSDRS
         000100
         000000G
37 00222 004737  JSR    PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
         000000G
38                                               ;    FOR ENOUGH AREA TO WORK
39                                               ;    WITH AND THAT FIRST TOKEN
40                                               ;    IS INDEED A LEFT PARENS
41 00226 000000G         +GETBUF                 ;GET BUFFER ADDRESS FROM COMMAND STRING
42                                               ;    AND CHECK IT AGAINST THE
43                                               ;    DEFINITION TABLE.
44 00230 000000G         +BUFRES                 ;RESET BUFFER POINTERS
45 00232 000000G         +SAVER2                 ;SAVE R2 ON STACK SINCE IT HAS THE
46                                               ;    BUFFER DESCRIPTOR ADDRESS.
47 00234 000000G         +CKCMGN                 ;GET "MODE" AND SAVE ON STACK
```



```
48 00236 000000G         +SAVFAC
49 00240 000000G         +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
50                                               ;    AND GET NPTS AND INTEGERIZE
51 00242 000000G         +INTST                  ;    MAX ALLOWABLE NBR POINTS IS
52                                               ;    65535.
53 00244 000000G         +SAVINT                 ;SAVE NPTS AS AN INTEGER ON THE STACK
54 00246 000000G         +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA AND
55                                               ;    GET "M".
56 00250 000000G         +SAVFAC                 ;SAVE IT ON THE STACK
57 00252 000000G         +CKCOMA                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
58 00254 000000G         +GETV                   ;GET VARIABLE ADDRESS OF NEWCSR
59 00256 000260'         .+2                     ;LEAVE POLISH MODE
60 00260 052626          BIS    (SP)+,(SP)+      ;M=0?
61 00262 001403          BEQ    DRS01            ;YES:  DRS IS CLOCK DRIVEN
62 00264 112700          MOVB   #1,R0            ;SET DRSON ON EXIT EQUAL TO PLUS NON-
         000001
63 00270 000402          BR     DRS02            ;    ZERO VALUE,
64 00272 012700 DRS01:   MOV    #-1,R0           ;M#0.  SET DRS ON EXIT EQUAL TO NEGATIVE
         177777
65                                               ;    NON-ZERO VALUE INDICATING DIGITAL
66                                               ;    INPUT LOADING.
67 00276 012667 DRS02:   MOV    (SP)+,DRSNPT     ;NBR OF POINTS TO TAKE
         000000G
68 00302 001420          BEQ    DRS05            ;IF ZERO, DISABLE SAMPLING
69 00304 105037          CLRB   @#BCDON          ;ASSUME BCD MODE
         000000G
70 00310 052626          BIS    (SP)+,(SP)+      ;GET MODE (BCD/BINARY)
71 00312 001402          BEQ    DRS03            ;BCD
72 00314 105237          INCB   @#BCDON          ;READ BINARY
         000000G
73 00320 012667 DRS03:   MOV    (SP)+,DRSBUF     ;SAVE BUFFER DESCRIPTOR ADDRESS
         000000G
74 00324 110037          MOVB   R0,@#DRSON       ;SET DRS OPERATION GOING
         000000G
75 00330 100403          BMI    DRS04            ;CLOCK DRIVEN?
76 00332 052737          BIS    #100,@#LPSDRS    ;YES:  ENABLE INPUT INTERRUPT ENABLE
         000100
         000000G
77 00340 000167 DRS04:   JMP    DIR2             ;RETURN STATUS REGISTER TO CALLER
         177520
78 00344 062706 DRS05:   ADD    #6,SP            ;CLEAN UP STACK
         000006
79 00350 000773          BR     DRS04            ;RETURN STATUS REGISTER TO CALLER
80                      ;
```

```
                        ;       .SBTTL  "REL" COMMAND PROCESSOR
                        ;
                        ;*****************************************************************
                        ;
                        ; "REL" COMMAND PROCESSOR
                        ;
                        ; BASIC FORM:   CALL "REL"(S,DIR)
                        ;
                        ; PURPOSE:  CLOSE OR OPEN RELAY "S".  THE COMMAND OPENS RELAY
                        ;               "S" (S = 1 OR 2) IF "DIR" IS EQUAL TO ZERO,
                        ;               OTHERWISE IT CLOSES IT.
                        ;
 00352                  REL:                            ;ENTRY POINT TO PROCESSOR
 00352 012765           MOV     #MAXR,T3(R5)    ;FOR LIMIT CHECK ON "S"
       000002'
       000062
 00360 004767           JSR     PC,POLENT       ;ENTER POLISH MODE AND CHECK
       000000G
                                                ;       FOR ENOUGH AREA TO WORK
                                                ;       WITH AND THAT FIRST TOKEN
                                                ;       IS INDEED A LEFT PARENS.
 00364 000000G          +GETNUM                 ;GET NUMERIC FROM COMMAND ("S")
 00366 000000G          +INTST                  ;INTEGERIZE AND TEST <=2
 00370 000000G          +SAVINT                 ;SAVE "S" ON THE STACK
 00372 000000G          +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
                                                ;       AND GET NEXT NUMERIC FROM
                                                ;       COMMAND STRING.
 00374 000376'          .+2                     ;LEAVE POLISH MODE
 00376 012703           MOV     #LPSDRS,R3      ;ADDRESS OF LPS DIGITAL I/O
       000000G
                                                ;       STATUS REGISTER.
 00402 012602           MOV     (SP)+,R2        ;GET RELAY NUMBER ("S")
 00404 003416           BLE     ERARG           ;ARG ERROR:  RELAY NUMBER NOT 1 OR 2
 00406 006002           ROR     R2
 00410 103401           BCS     REL1            ;RELAY #1 SELECTED
 00412 005203           INC     R3              ;RELAY #2:  POINT TO LEFT BYTE IN
                                                ;       STATUS REGISTER
 00414 056565 REL1:     BIS     FAC2(R5),FAC1(R5) ;SET OR CLEAR FLAG?
       000042
       000040
 00422 001403           BEQ     REL3            ;CLEAR
 00424 152713           BISB    #1,(R3)         ;SET RELAY "S"
       000001
 00430 000402           BR      REL2
 00432 142713 REL3:     BICB    #1,(R3)         ;RESET RELAY "S"
       000001
 00436 000137 REL2:     JMP     @#CKRPAR        ;MAKE SURE LAST TOKEN IS A ")"
       000000G
                                                ;       AND RETURN TO THE BASIC
                                                ;       INTERPRETER.
 00442 000137 ERARG:    JMP     @#ERRARG        ;ARG ERROR
       000000G
                        ;
```



```
                        ;       .SBTTL  DRS INTERRUPT ROUTINE
                        ;
                        ;*****************************************************************
                        ;
                        ; DRS INTERRUPT ROUTINE
                        ;
 000446                 DRSINT:
 000446 004737          JSR     PC,@#REGSAV     ;SAVE R0, R2, AND R3 ON STACK
        000000G
 000452 013703          MOV     @#LPSDIB,R3     ;READ DIGITAL INPUT REGISTER
        000000G
 00456 105737           TSTB    @#DRSON         ;DRS OPERATION IN PROGRESS?
        000000G
 00462 003414           BLE     DRS4            ;NO:  DISABLE INTERRUPTS AND EXIT
 00464 105737           TSTB    @#BCDON         ;CONVERT TO BCD?
        000000G
 00470 001002           BNE     DRS1            ;NO:  TREAT AS A PURE BINARY NUMBER
 00472 004767           JSR     PC,CONBCD       ;CONVERT BCD TO BINARY
        000000G
 00476 016702 DRS1:     MOV     DRSBUF,R2       ;STORE DATA IN USER'S BUFFER
        000000G
 00502 004737           JSR     PC,@#STODAT
        000000G
 00506 005367           DEC     DRSNPT          ;ALL POINTS TAKEN?
        000000G
 00512 001007           BNE     DRS2            ;NO
 00514 105037 DRS4:     CLRB    @#DRSON         ;CLEAR DRSON DONE FLAG
        000000G
 00520 042737           BIC     #100,@#LPSDRS   ;DISABLE DIR INTERRUPT ENABLE
        000100
        000000G
 00526 000137 DRS3:     JMP     @#RESTOR        ;RESTORE REGISTERS AND EXIT
        000000G
 00532 052737 DRS2:     BIS     #100,@#LPSDRS   ;RE-ENABLE INTERRUPT ENABLE BIT
        000100
        000000G
 00540 000772           BR      DRS3            ;RESTORE REGISTERS AND EXIT
                        ;
       000001'          .END                    ;END OF MODULE #3
```

```
LPS3  V01-01    RT-11 MACRO VM02-09   16-OCT-74 02:02:11 PAGE 9+
SYMBOL TABLE

BAD    = 000010          BCDON = ****** G        BEG    = 000000
BUFRES= ****** G         CKCMGN= ****** G        CKCOMA= ****** G
CKRPAR= ****** G         CONBCD= ****** G        DEL    = 000012
DIR     000004RG         DIR1    000046R         DIR2    000064R
DIR3    000070R          DOR     000100RG        DOR1    000144R
DOR2    000150R          DR8     000166RG        DR8BUF= ****** G
DR8INT  000446R          DR8IP = ****** G        DR8IVA= ****** G
DR8NPT= ****** G         DR8ON = ****** G        DRS01   000272R
DRS02   000276R          DRS03   000320R         DRS04   000340R
DRS05   000344R          DRS1    000476R         DRS2    000532R
DRS3    000526R          DRS4    000514R         END    = 000002
ENTERP= ****** G         ERARG   000442R         ERBUF  = ****** G
ERNOR  = ****** G        ERRARG= ****** G        ERRPDL= ****** G
ERRSYN= ****** G         EVAL   = ****** G       FAC1   = 000040
FAC2   = 000042          FLOAT  = ****** G       GET    = 000006
GETADD= ****** G         GETBUF= ****** G        GETDAT= ****** G
GETNUM= ****** G         GETV   = ****** G       GETVAR= ****** G
HISTON= ****** G         INT    = ****** G       INTST  = ****** G
LPSDIB= ****** G         LPSDOR= ****** G        LPSDRS= ****** G
MAXD    000000R          MAXR    000002R         NARRAY= ****** G
NUMSGN= ****** G         PC     =%000007         POLENT= ****** G
POLRET= 000134           PS     = 177776         PUT    = 000004
REGSAV= ****** G         REL     000352RG        REL1    000414R
REL2    000436R          REL3    000432R         RESTOR= ****** G
RESTR2= ****** G         RETURN= 000207          RTSON  = ****** G
R0     =%000000          R1     =%000001         R2     =%000002
R3     =%000003          R4     =%000004         R5     =%000005
SAVER2= ****** G         SAVFAC= ****** G        SAVINT= ****** G
SP     =%000006          SS1SAV= 000024          SS2SAV= 000026
STODAT= ****** G         STORXT= ****** G        STOVAR= ****** G
TABLE  = ****** G        T1     = 000056         T2     = 000060
T3     = 000062          VARSAV= 000022          .COMMA= ****** G
.LPAR  = ****** G        .RPAR  = ****** G
. ABS.    000000     000
          000542     001
ERRORS DETECTED: 0
FREE CORE: 17906. WORDS

LPS3,LP:=LPS3
```

```
LPS4  V01-01    RT-11 MACRO VM02-09   16-OCT-74 02:03:31 PAGE 1


1                .TITLE  LPS4  V01-01
2                ;.SBTTL LPS MODULE #4
3                ;
4                ; DEC-11-LBEXA-B-LA5    BASIC KERNEL  V02-01
5                ;
6                ; COPYRIGHT (C) 1973,1974
7                ;
8                ; DIGITAL EQUIPMENT CORPORATION
9                ; MAYNARD, MASSACHUSETTS 01754
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26               ;
27               ; WRITTEN BY:  RICK MULLY       FEB,, 1973
28               ;
```

```
1               ;       .SBTTL  CONTENTS OF MODULE #4
2               ;
3               ; THE FOLLOWING COMMAND PROCESSORS EXIST IN THIS MODULE:
4               ;
5               ;       CLRD
6               ;       PUTD
7               ;       DIS
8               ;       FSH
9               ;       DXY
10              ;
```



```
1               ;       .SBTTL  PROGRAM GLOBALS
2               ;
3               ; GLOBALS REQUIRED FOR COMMUNICATION WITH THE BASIC
4               ; INTREPRETER.
5               ;
6                       .GLOBL  ERRPDL,ERRSYN,ERRARG
7                       .GLOBL  EVAL,GETVAR,STOVAR
8                       .GLOBL  INT,.COMMA,.RPAR
9                       .GLOBL  NUMSGN,.LPAR,$IR
10                      .GLOBL  $MLR,$DVR,$POLSH
11                      .GLOBL  DISPLY
12              ;
13              ; GLOBALS REQUIRED FOR COMMUNICATIONS WITH THE VARIOUS
14              ; LPS MODULES.
15              ;
16                      .GLOBL  TABLE,NARRAY,FLOAT
17                      .GLOBL  POLENT,GETADD,GETNUM
18                      .GLOBL  CKCMGN,INTST,GETV
19                      .GLOBL  GETBUF,REGSAV,ERNOR
20                      .GLOBL  STORXT,CKRPAR,ERBUF
21                      .GLOBL  CKCOMA,ENTERP,STODAT
22                      .GLOBL  GETDAT,RTSON,DRSON
23                      .GLOBL  SAVER2,SAVFAC,RESTR2
24                      .GLOBL  RESTOR,HISTON,BCDON
25                      .GLOBL  CONBCD,BUFRES,DRSNPT
26                      .GLOBL  SAVINT
27              ;
28              ; GLOBALS REQUIRED FOR COMMAND PROCESSORS
29              ;
30                      .GLOBL  CLRD,PUTD,DIS,FSH,DXY
31              ;
32              ; GLOBALS FOR DEVICE ADDRESSES
33              ;
34                      .GLOBL  LPDISS,LPDISX,LPDISY
35              ;
36              ;GLOBALS FOR INTERRUPT VECTOR AND PRIORITY.
37                      .GLOBL LPSIVA,LPSIP
```

```
                        ;       .SBTTL  REGISTER ASSIGNMENTS AND EQUATES
                        ;
        000000 R0       =       %0
        000001 R1       =       %1
        000002 R2       =       %2
        000003 R3       =       %3
        000004 R4       =       %4
        000005 R5       =       %5
        000006 SP       =       %6
        000007 PC       =       %7
                        ;
                        ; GENERAL EQUATES
                        ;
        177776 PS       =       -2              ;PS = PROCESSOR STATUS WORD
        000207 RETURN   =       207             ;207 = RTS PC
        000134 POLRET   =       134             ;134 = JMP @(R4)+
                        ;
                        ; BASIC USER'S EQUATES
                        ;
        000022 VARSAV   =       22              ;VAR SAVE FOR ASSIGNMENT
        000024 S$1SAV   =       24              ;S$1 SAVE FOR ASSIGNMENT
        000026 S$2SAV   =       26              ;S$2 SAVE FOR ASSIGNMENT
        000040 FAC1     =       40              ;HIGH ORDER FLOATING VALUE
        000042 FAC2     =       42              ;LOW  ORDER FLOATING VALUE
        000044 R0SAVE   =       44              ;R0 SAVE LOCATION
        000046 R1SAVE   =       46              ;R1 SAVE LOCATION
        000050 R2SAVE   =       50              ;R2 SAVE LOCATION
        000052 R3SAVE   =       52              ;R3 SAVE LOCATION
        000056 T1       =       56              ;SHORT TERM TEMPORARY
        000060 T2       =       60              ;SHORT TERM TEMPORARY
        000062 T3       =       62              ;SHORT TERM TEMPORARY
                        ;
                        ; BUFFER DESCRIPTOR EQUATES
                        ;
        000000 BEG      =       0               ;OFFSET TO BEGINNING OF BUFFER POINTER
        000002 END      =       2               ;OFFSET TO END OF BUFFER POINTER
        000004 PUT      =       4               ;OFFSET TO PUT DATA POINTER
        000006 GET      =       6               ;OFFSET TO GET DATA POINTER
        000010 BAD      =       10              ;OFFSET TO BAD DATA FLAG
        000012 DEL      =       12              ;OFFSET TO DISPLAY DELTA X
                        ;
```



```
                        ;
                        ; DISPLAY TABLE EQUATES
                        ;
        000000 DSTY     =       0               ;BUFFER START ADDRESS FOR Y
        000002 DSTX     =       2               ;BUFFER START ADDRESS FOR X OR
                                                ;    X POSITION ON FACE OF CRT.
        000004 DPTY     =       4               ;BUFFER POINTER FOR Y
        000006 DPTX     =       6               ;BUFFER POINTER FOR X OR X INCREMENT
        000010 DTNPTS   =       10              ;NBR OF POINTS (TOTAL)
        000012 DLNPTS   =       12              ;NBR OF POINTS (RUNNING)
        000014 DSW      =       14              ;DISPLAY ON/OFF SWITCH
        000015 DSX      =       15              ;SWITCH FOR X INCREMENT OR X BUFFER
        000016 DNPTI    =       16              ;INITIAL "N" (NBR OF POINTS PER CALL
        000020 DNPTR    =       20              ;RUNNING VALUE FOR "N"
        000022 DISINC   =       22              ;Y/(X) BUFFER INCREMENT ON DATA
        000024 DENDY    =       24              ;END OF ARRAY Y
        000026 DENDX    =       26              ;END OF ARRAY X
                        ;
                        ;
                        ; DISPLAY TABLE FOR "DIS" AND "DXY" COMMANDS
                        ;
00000 000000 000000 RESDIS: .WORD   0,0,0,0,0,0,0
   00002 000000
   00004 000000
   00006 000000
   00010 000000
   00012 000000
00014 000000            .WORD   0,0,0,0,0,0,0
   00016 000000
   00020 000000
   00022 000000
   00024 000000
   00026 000000
                        ;
                        ; DISPLAY TABLE FOR "FSH" COMMAND
                        ;
00030 000000 000000 NONRES: .WORD   0,0,0,0,0,0,0
   00032 000000
   00034 000000
   00036 000000
   00040 000000
   00042 000000
00044 000000            .WORD   0,0,0,0,0,0,0
   00046 000000
   00050 000000
   00052 000000
   00054 000000
   00056 000000
                        ;
                        ; LIMIT TESTS
                        ;
00060 007777 MAXD:      .WORD   7777            ;4095
00062 007777 MAXC:      .WORD   7777            ;4095
00064 177777 MAXP:      .WORD   177777          ;65535
                        ;
```

45

```
                ;       .SBTTL  "CLRD" COMMAND PROCESSOR
                ;
                ;*****************************************************************
                ;
                ; "CLRD" COMMAND PROCESSOR
                ;
                ; BASIC FORM:   CALL "CLRD"(BUF,SIZE,SCALE)
                ;
                ; PURPOSE:  DEFINE DISPLAY BUFFER HAVING FIXED DELTA X VALUES,
                ;               "BUF" IS THE NAME OF THE BUFFER TO BE DISPLAYED,
                ;               AND CONTAINS SINGLE WORD VALUES.  VALUES WHICH
                ;               FALL IN THE RANGE 4095 >= VALUE >= 0 ARE DIS-
                ;               PLAYED WHILE VALUES OUTSIDE THIS ARE NOT.
                ;               THE "SIZE" OF THE BUFFER IS THE NUMBER OF Y
                ;               POINTS TO DISPLAY AND MUST BE <= TO THE NUMBER
                ;               DEFINED IN THE USE AND DIM COMMANDS.  THE DELTA X
                ;               IS CALCULATED AS 4096/"SIZE" AND MAY BE FRACTIONAL.
                ;
                ;               IF "SCALE" = 0, CLRD WILL SET ALL BUFFER VALUES
                ;               TO -1 (NON-DISPLAYABLE VALUES).  IF "SCALE" DOES NOT
                ;               =0, CLRD DOES NOT CLEAR THE ARRAY AND THE ORIG-
                ;               INAL DATA IS MULTIPLIED BY "SCALE".  IN EITHER CASE, THE
                ;               PUTD POINTERS ARE RESET TO POINT TO THE
                ;               BEGINNING OF THE ARRAY.  DATA IS ENTERED INTO THE
                ;               ARRAY THROUGH THE PUTD FUNCTION, HOWEVER, A
                ;               CLRD MUST BE ISSUED BEFORE DATA IS INITIALLY
                ;               TRANSFERRED TO THE ARRAY.
                ;
                ;               A CLRD MUST BE ISSUED AT LEAST ONCE BEFORE
                ;               ISSUING THE PUTD, DIS, OR FSH FUNCTIONS.
                ;
000066          CLRD:                           ;ENTRY POINT TO PROCESSOR
000066 012765   CLRD:   MOV     #MAXC,T3(R5)    ;FOR LIMIT TESTING OF "SIZE"
       000062'
       000062
000074 004737           JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
       000000G
                                                ;       FOR ENOUGH AREA TO WORK
                                                ;       WITH AND THAT FIRST TOKEN
                                                ;       IS INDEED A LEFT PARENS.
000100 000000G          +GETBUF                 ;GET BUFFER ADDRESS FROM COMMAND STRING
                                                ;       AND CHECK IT AGAINST THE
                                                ;       DEFINITION TABLE.
000102 000000G          +BUFRES                 ;RESET BUFFER POINTERS
000104 000000G          +SAVER2                 ;SAVE R2 ON THE STACK
000106 000000G          +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
                                                ;       AND GET NUMERIC FROM COMMAND ("SIZE")
000110 000000G          +INTST                  ;INTERGIZE RESULT AND TEST <= 4095.
000112 000000G          +SAVINT                 ;SAVE "SIZE"
000114 000000G          +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
                                                ;       AND GET NUMERIC FROM COMMAND ("MODE")
000116 000000G          SAVFAC                  ;SAVE "SCALE" ON STACK
000120 000122'          .+2                     ;LEAVE POLISH MODE
000122 012665           MOV     (SP)+,T2(R5)    ;GET "SCALE" AND SAVE IT
       000060
000126 012665           MOV     (SP)+,T1(R5)
       000056
```



```
000132 012600           MOV     (SP)+,R0        ;GET "SIZE"
000134 003420           BLE     CLRD0           ;SIZE <= 0 IS ILLEGAL
000136 012602           MOV     (SP)+,R2        ;R2 POINTS TO BUFFER DESCRIPTOR ADDRESS
000140 011203           MOV     (R2),R3         ;GET START ADDRESS OF BUFFER
000142 010065           MOV     R0,R0SAVE(R5)   ;SAVE R0 THRU R3 FOR LATER USE
       000044
000146 010165           MOV     R1,R1SAVE(R5)
       000046
000152 010265           MOV     R2,R2SAVE(R5)
       000050
000156 010365           MOV     R3,R3SAVE(R5)
       000052
000162 016246           MOV     END(R2),-(SP)   ;CALCULATE SIZE OF BUFFER
       000002
000166 160316           SUB     R3,(SP)         ;(END ADDRESS - BEGINNING ADDRESS)/2
000170 006216     *     ASR     (SP)
000172 020026           CMP     R0,(SP)+        ;"SIZE" <= BUFFER SIZE?
000174 003402           BLE     CLRD1           ;YES:  CONTINUE
000176 000137 CLRD0:    JMP     @#ERNOR         ;"SIZE" TOO LARGE
       000000G
000202 020027 CLRD1:    CMP     R0,#4096.       ;IS "SIZE" >= 4096?
       010000
000206 103020           BHIS    CLRD3           ;YES:  SET DELTA X =1 AND FRACTION
                                                ;       =0.
000210 012746           MOV     #4096.,-(SP)    ;4096 POINTS ON X SCALE OF SCOPE
       010000
000214 004437           JSR     R4,@#$POLSH     ;CALCULATE (4096./"SIZE")*8.
       000000G
000220 000000G          +$IR                    ;FLOAT 4096.
000222 000466'          +PUSHR0                 ;NOW PUT "SIZE" BACK ON STACK AND
                                                ;       FLOAT IT.
000224 000000G          +$IR
000226 000000G          +$DVR                   ;(BUF SIZE/"SIZE")
000230 000474'          +PUSH8                  ;PUSH A FLOATING POINT 8. ON STACK
000232 000000G          +$MLR                   ;*8.
000234 000454'          +TRAFAC                 ;TRANSFER RESULT TO THE FAC
000236 000000G          +INTST                  ;INTEGERIZE RESULT IN FAC
000240 000242'          .+2                     ;LEAVE POLISH MODE
000242 016500           MOV     FAC2(R5),R0     ;IF INCREMENT =0, SET =1
       000042
000246 001002           BNE     CLRD2
000250 012700 CLRD3:    MOV     #8.,R0          ;SET INCREMENT =1 (1*8. WITH A FRACTION
       000010
                                                ;       OF ZERO)
000254 016502 CLRD2:    MOV     R2SAVE(R5),R2   ;SAVE DELTA X FOR THIS BUFFER
       000050
000260 010062           MOV     R0,DEL(R2)
       000012
000264 016546           MOV     T2(R5),-(SP)    ;PUT "SCALE" FACTOR ON STACK
       000060
000270 016546           MOV     T1(R5),-(SP)
       000056
000274 001005           BNE     CLRD4           ;IF AN INTEGER, FLOAT RESULT
000276 005726           TST     (SP)+
000300 004437           JSR     R4,@#$POLSH     ;FLOAT "SCALE" FACTOR
       000000G
000304 0000000          +$IR
```

```
94 00306 000310'        ,+2                     ;LEAVE POLISH MODE
95 00310 016646 CLRD4:  MOV     2(SP),-(SP)     ;SAVE A 2ND COPY OF "SCALE" ON
         000002
96 00314 016646         MOV     2(SP),-(SP)     ;    THE STACK.
         000002
97 00320 001450         BEQ     CLRD5           ;"SCALE" FACTOR WAS EQUAL TO ZERO,
98                                              ;    CLEAR OUT ARRAY.
99 00322 017503         MOV     @R3SAVE(R5),R3  ;MULTIPLY DATA BY "SCALE" FACTOR
         000052
100 0326 004737         JSR     PC,@#FLOAT      ;FLOAT IF DATA IS 16 BITS.
         000000G
101 0332 016546         MOV     FAC2(R5),-(SP)  ;PUT DATA ON STACK IN STANDARD
         000042
102 0336 016546         MOV     FAC1(R5),-(SP)  ;    FLOATING POINT FORM.
         000040
103 0342 001005         BNE     CLRD7           ;DATA ALREADY FLOATED
104 0344 005726         TST     (SP)+           ;FLOAT NUMBER
105 0346 004437         JSR     R4,@#$POLSH
         000000G
106 0352 000000G        +$IR
107 0354 000356'        ,+2
108 0356 012765 CLRD7:  MOV     #MAXP,T3(R5)    ;RESET INTEGER TEST
         000064'
         000062
109 0364 004437         JSR     R4,@#$POLSH     ;ENTER POLISH MODE
         000000G
110 0370 000000G        +$MLR                   ;MULTIPLY DATA BY "SCALE" FACTOR
111 0372 000454'        +TRAFAC                 ;TRANSFER RESULT TO THE FAC
112 0374 000000G        +INTST                  ;INTEGERIZE IT
113 0376 000400'        ,+2                     ;LEAVE POLISH MODE
114 0400 016575 CLRD6:  MOV     FAC2(R5),@R3SAVE(R5); SAVE NEW DATA
         000042
         000052
115 0406 062765         ADD     #2,R3SAVE(R5)   ;POINTS TO NEXT DATA POINT
         000002
         000052
116 0414 016502         MOV     R2SAVE(R5),R2   ;ARRAY DESCRIPTOR ADDRESS
         000050
117 0420 026562         CMP     R3SAVE(R5),END(R2) ;END OF ARRAY?
         000052
         000002
118 0426 101730         BLOS    CLRD4           ;NO:  CONTINUE
119 0430 022626         CMP     (SP)+,(SP)+     ;CLEAN UP STACK
120 0432 016501         MOV     R1SAVE(R5),R1   ;RESTORE R1
         000046
121 0436 000137         JMP     @#CKRPAR        ;MAKE SURE LAST TOKEN IS A ")" AND
         000000G
122                                             ;    RETURN TO THE BASIC INTREPRETER.
123             ;
124 0442 022626 CLRD5:  CMP     (SP)+,(SP)+     ;IGNORE "SCALE" ON STACK
125 0444 012765         MOV     #-1,FAC2(R5)    ;SET DATA ELEMENT =-1 (NON DISPLAYABLE)
         177777
         000042
126 0452 000752         BR      CLRD6
127             ;
128 0454 012665 TRAFAC: MOV     (SP)+,FAC1(R5)  ;POLISH ROUTINE TO TRANSFER STACK
         000040
```



```
129                                             ;    DATA TO FAC.
130 0460 012665         MOV     (SP)+,FAC2(R5)
         000042
131 0464 000134         POLRET                  ;RETURN IN POLISH MODE
132             ;
133 0466 016546 PUSHR0: MOV     R0SAVE(R5),-(SP) ;POLISH ROUTINE TO PUSH R0SAVE (SIZE)
         000044
134                                             ;    ON THE STACK.
135 0472 000134         POLRET                  ;RETURN IN POLISH MODE
136             ;
137 0474 016746 PUSH8:  MOV     FP8+2,-(SP)     ;PUSH FLOATING POINT 8. ON STACK
         000010
138 0500 016746         MOV     FP8,-(SP)
         000002
139 0504 000134         POLRET                  ;RETURN IN POLISH MODE
140             ;
141 0506 041000 FP8:    .WORD   041000,0        ;FLOATING POINT 8.
    0510 000000
```

```
                ;       .SBTTL  "PUTD" COMMAND PROCESSOR
                ;
                ;*****************************************************************
                ;
                ; "PUTD" COMMAND PROCESSOR
                ;
                ; BASIC FORM:   CALL "PUTD"(BUF,Y)
                ;
                ; PURPOSE:  PUT DATA POINT "Y" INTO BUF IN SEQUENTIAL ORDER,
                ;               WHERE 65535 >= Y >= 0,  THIS FUNCTION DOES NOT
                ;               INITIATE A DISPLAY, BUT RATHER JUST ENTERS A
                ;               DATA POINT INTO THE SPECIFIED ARRAY.
                ;
 00512          PUTD:                           ;ENTRY POINT TO PROCESSOR
 00512 012765   PUTD:   MOV     #MAXP,T3(R5)    ;FOR LIMIT TESTING OF "Y"
        000064'
        000062
 00520 004737           JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
        000000G
                                                ;       FOR ENOUGH AREA TO WORK
                                                ;       WITH AND THAT FIRST TOKEN
                                                ;       IS INDEED A LEFT PARENS.
 00524 000000G          +GETBUF                 ;GET BUFFER ADDRESS FROM COMMAND STRING
                                                ;       AND CHECK IT AGAINST THE
                                                ;       DEFINITION TABLE.
 00526 000000G          +SAVER2                 ;SAVE R2 ON THE STACK
 00530 000000G          +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
                                                ;       AND GET NUMERIC FROM COMMAND ("Y")
 00532 000000G          +INTST                  ;INTEGERIZE RESULT AND TEST <= 65535.
 00534 000000G          +RESTR2                 ;RESTORE R2
 00536 000540'          .+2                     ;EXIT POLISH MODE
 00540 016503           MOV     FAC2(R5),R3     ;STORE RESULT NOW
        000042
 00544 004737           JSR     PC,@#STODAT
        000000G
 00550 000137           JMP     @#CKRPAR        ;MAKE SURE LAST TOKEN IS A ")" AND
        000000G
                                                ;       RETURN TO THE BASIC INTREPRETER.
                ;
```



```
                ;       .SBTTL  "DIS" COMMAND PROCESSOR
                ;
                ;*****************************************************************
                ;
                ; "DIS" COMMAND PROCESSOR
                ;
                ; BASIC FORM:   CALL "DIS"(BUF,N,I)
                ;
                ; PURPOSE:  DISPLAY DATA FROM BUF WHENEVER BASIC IS IDLE.  THE
                ;               POINTS DISPLAYED START WITH THE NTH POINT IN
                ;               THE BUFFER AND PROCEED IN INCREMENTS OF I.
                ;               IF I=1, CONSECUTIVE POINTS STARTING WITH THE NTH
                ;               ONE IS DISPLAYED.  IF I=2, EVERY OTHER POINT
                ;               IS DISPLAYED, ETC..
                ;
 00554          DIS:                            ;ENTRY POINT TO PROCESSOR
 00554 012765   DIS:    MOV     #DIS1,T1(R5)    ;RETURN PC FOR ARGUMENT PARSER
        000572'
        000056
 00562 005065           CLR     T2(R5)          ;INDICATE "DIS" ACTIVE
        000060
 00566 000167           JMP     DISPAR          ;NOW PARSE LINE
        000216
 00572 012703   DIS1:   MOV     #RESDIS,R3      ;SETUP DISPLAY TABLE
        000000'
 00576 004767           JSR     PC,DSETUP
        000270
 00602 005723           TST     (R3)+           ;R3=R3+2
 00604 012713           MOV     #4,(R3)         ;ASSUME 4 POINTS PER CALL TO
        000004
                                                ;       DISPLAY ROUTINE
 00610 012323           MOV     (R3)+,(R3)+
 00612 016513           MOV     FAC2(R5),(R3)   ;GET Y INCREMENT BETWEEN CHANNELS
        000042
 00616 006313           ASL     (R3)            ;CONVERT TO A WORD OFFSET
 00620          DIS3:
 00620 062706           ADD     #4,SP           ;CLEAN UP STACK
        000004
 00624 000137           JMP     @#CKRPAR        ;MAKE SURE LAST TOKEN IS A ")"
        000000G
                                                ;       AND RETURN TO THE BASIC
                                                ;       INTERPRETER.
                ;
```

```
1                       ;       .SBTTL  "FSH" COMMAND PROCESSOR
2                       ;
3                       ;*****************************************************************
4                       ;
5                       ; BASIC FORM:   CALL "FSH"(BUF,N,I)
6                       ;
7                       ; PURPOSE:  IDENTICAL TO DIS EXCEPT THE DATA POINTS IN BUF ARE
8                       ;               DISPLAYED ONLY ONCE.  THE NEXT BASIC STATE-
9                       ;               MENT IS THEN EXECUTED.
10                      ;
11 00630                FSH:                            ;ENTRY POINT TO PROCESSOR
12 00630 012765         FSH:    MOV     #FSH1,T1(R5)    ;RETURN PC FOR ARGUMENT PARSER
         000646'
         000056
13 00636 005065                 CLR     T2(R5)          ;INDICATE "FSH" ACTIVE
         000060
14 00642 000167                 JMP     DISPAR          ;NOW PARSE LINE
         000142
15 00646 012703 FSH1:   MOV     #NONRES,R3      ;SETUP DISPLAY TABLE
         000030'
16 00652 004767                 JSR     PC,DSETUP
         000214
17 00656 005723                 TST     (R3)+           ;R3=R3+2
18 00660 016313                 MOV     -6(R3),(R3)     ;DISPLAY ENTIRE SWEEP ON EVERY CALL
         177772
19                                                      ;       TO THE DISPLAY ROUTINE.
20 00664 012323                 MOV     (R3)+,(R3)+
21 00666 016513                 MOV     FAC2(R5),(R3)   ;GET Y INCREMENT BETWEEN CHANNELS
         000042
22 00672 006313                 ASL     (R3)            ;CONVERT TO A WORD OFFSET
23 00674 012702                 MOV     #NONRES,R2      ;NOW FLASH UP A COMPLETE SWEEP
         000030'
24 00700 004767                 JSR     PC,DSPLY
         000266
25 00704 000745                 BR      DIS3            ;GET Y INCREMENT BETWEEN CHANNELS,
26                                                      ;       CLEAN UP STACK, DISPLAY DATA,
27                                                      ;       AND RETURN BACK TO THE BASIC
28                                                      ;       INTERPRETER.
29                      ;
```



```
1                       ;       .SBTTL  "DXY" COMMAND PROCESSOR
2                       ;
3                       ;*****************************************************************
4                       ;
5                       ; BASIC FORM:   "DXY"(BUF1,BUF2,N,I)
6                       ;
7                       ; PURPOSE:  DISPLAY DATA FROM BUF1 AND BUF2.  BUF1 AND BUF2
8                       ;               HAVE THE X AND Y VALUES RESPECTIVELY.  NO DELTA
9                       ;               X IS USED FROM THE CLRD,  OTHERWISE
10                      ;               DXY IS IDENTICAL TO DIS AND FSH.
11                      ;
12 00706                DXY:                            ;ENTRY POINT TO PROCESSOR
13 00706 012765         DXY:    MOV     #DXY1,T1(R5)    ;RETURN PC FOR ARGUMENT PARSER
         000724'
         000056
14 00714 010565                 MOV     R5,T2(R5)       ;INDICATE "DXY" ACTIVE
         000060
15 00720 000167                 JMP     DISPAR          ;NOW PARSE LINE
         000064
16 00724 012703 DXY1:   MOV     #RESDIS,R3      ;SETUP DISPLAY TABLE
         000000'
17 00730 004767                 JSR     PC,DSETUP
         000136
18 00734 052723                 BIS     #400,(R3)+      ;SET DSX ACTIVE
         000400
19 00740 012713                 MOV     #4,(R3)         ;ASSUME 4 POINTS PER CALL TO
         000004
20 00744 012323                 MOV     (R3)+,(R3)+     ;       DISPLAY ROUTINE
21 00746 016513                 MOV     FAC2(R5),(R3)   ;GET Y INCREMENT BETWEEN CHANNELS
         000042
22 00752 006313                 ASL     (R3)            ;CONVERT TO A WORD OFFSET
23 00754 016602                 MOV     4(SP),R2        ;GET X BUFFER DESCRIPTOR ADDRESS NOW
         000004
24 00760 016263                 MOV     END(R2),4(R3)   ;END ADDRESS OF ARRAY X
         000002
         000004
25 00766 162703                 SUB     #20,R3          ;RESET TABLE ADDRESS
         000020
26 00772 011213                 MOV     (R2),(R3)       ;INITIAL START ADDRESS OF X ARRAY
27 00774 061613                 ADD     (SP),(R3)       ;ADD IN STARTING CHANNEL -1
28 00776 005313                 DEC     (R3)
29 01000 011363                 MOV     (R3),4(R3)
         000004
30 01004 005726                 TST     (SP)+           ;POP OFF TOP STACK ELEMENT,
31 01006 000704                 BR      DIS3            ;       REST IS CLEARED OFF IN DIS
32                                                      ;       ROUTINE.
33                      ;
```

```
                        ;       .SBTTL  DISPLAY COMMAND PARSER FOR DIS, FSH, AND DXY
                        ;
                        ; ROUTINE TO PARSE COMMAND LINE FOR DIS, FSH AND THE DXY COMMANDS.
                        ;
                        ; CALL:
                        ;       MOV     #RETURN,T1(R5)
                        ;       CLR     T2(R5)          ;FOR DIS AND FSH;  MOV R5,T2(R5)
                        ;                               ;    FOR DXY
                        ;       JMP     DISPAR
                        ;RETURN: NEXT INSTRUCTION
                        ;
01010                   DISPAR:
01010 012765            MOV     #MAXD,T3(R5)    ;FOR LIMIT TESTS ON N AND I
      000060'
      000062
01016 004737            JSR     PC,@#POLENT     ;ENTER POLISH MODE AND CHECK
      000000G
                                                ;    FOR ENOUGH AREA TO WORK
                                                ;    WITH AND THAT FIRST TOKEN
                                                ;    IS INDEED A LEFT PARENS.
01022 000000G           +GETBUF                 ;GET BUFFER ADDRESS FROM COMMAND
                                                ;    AND CHECK IT AGAINST THE
                                                ;    DEFINITION TABLE.
01024 000000G           +SAVER2                 ;SAVE R2 ON STACK
01026 001056'           +TSTDXY                 ;TEST FOR DXY COMMAND
01030 000000G           +CKCOMA                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
01032 000000G           +GETBUF                 ;GET NEXT BUFFER ADDRESS AND CHECK IT
01034 000000G           +SAVER2                 ;SAVE IT ALSO
01036 000000G           +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
                                                ;    AND GET NUMERIC FROM COMMAND.
01040 000000G           +INTST                  ;INTEGERIZE RESULT AND TEST <=7777.
01042 000000G           +SAVINT                 ;SAVE "N"
01044 000000G           +CKCMGN                 ;CHECK NEXT TOKEN EQUAL TO A COMMA
                                                ;    AND GET NUMERIC FROM COMMAND.
01046 000000G           +INTST                  ;INTEGERIZE RESULT AND TEST <=7777.
01050 001052'           .+2                     ;LEAVE POLISH MODE
01052 000175            JMP     @T1(R5)         ;RETURN TO CALLER
      000056
                        ;
01056 005765 TSTDXY:    TST     T2(R5)          ;DXY COMMAND?
      000060
01062 001002            BNE     TST1            ;YES:  RETURN IMMEDIATELY
01064 062704            ADD     #6,R4           ;BYPASS ANOTHER BUFFER PROCESSING
      000006
01070 000134 TST1:      POLRET                  ;RETURN IN POLISH MODE
                        ;
```



```
                        ;       .SBTTL  SETUP DISPLAY TABLE
                        ;
                        ; ROUTINE TO SETUP A DISPLAY TABLE
                        ;
                        ; CALL:
                        ;       MOV     #ADDRESS OF TABLE,R3
                        ;       JSR     PC,DSETUP
                        ;       R3 ON RETURN POINTS TO DSW IN TABLE
                        ;
01072                   DSETUP:
01072 016602            MOV     4(SP),R2        ;GET BUFFER DESCRIPTOR ADDRESS
      000004
01076 011213            MOV     (R2),(R3)       ;INITIAL START ADDRESS OF ARRAY
01100 016263            MOV     END(R2),DENDY(R3) ;END OF ARRAY
      000002
      000024
01106 066613            ADD     2(SP),(R3)      ;ADD IN STARTING CHANNEL -1
      000002
01112 005323            DEC     (R3)+
01114 005023            CLR     (R3)+           ;ASSUME DIS OR FSH COMMAND
01116 016323            MOV     -4(R3),(R3)+    ;RESET BUFFER PONTERS
      177774
01122 016223            MOV     DEL(R2),(R3)+   ;DELTA X DEFINED IN "CLRD"
      000012
01126 001002            BNE     DSET1
01130 000137            JMP     @#ERRARG        ;ZERO VALUE IS ILLEGAL HERE
      000000G
01134 016213 DSET1:     MOV     END(R2),(R3)    ;CALCULATE NBR OF POINTS TO DISPLAY
      000002
01140 161213            SUB     (R2),(R3)
01142 006213            ASR     (R3)
01144 012323            MOV     (R3)+,(R3)+
01146 012713            MOV     #1,(R3)         ;SET DISPLAY ACTIVE
      000001
01152 000207            RETURN                  ;RETURN TO CALLER
                        ;
                        ; ENTRY POINT FROM BASIC DURING IDLE LOOP IN ORDER TO REFRESH
                        ; THE DISPLAY.
                        ;
01154                   DISPLY:
01154 010246            MOV     R2,-(SP)        ;SAVE R2 ON THE STACK
01156 012702            MOV     #RESDIS,R2      ;RESIDENT DISPLAY TABLE
      000000'
01162 004767            JSR     PC,DSPLY        ;DISPLAY SOME POINTS
      000004
01166 012602            MOV     (SP)+,R2        ;RESTORE R2
01170 000207            RETURN                  ;RETURN FROM BASIC'S IDLE LOOP
                        ;
```

```
                        ;       .SBTTL  ACTUAL DISPLAY ROUTINE
                        ;
                        ; ROUTINE TO DISPLAY A SERIES OF POINTS ON THE CRT.
                        ;
                        ; CALL:
                        ;       R2 POINTS TO DISPLAY TABLE
                        ;       JSR     PC,DSPLY
                        ;
001172                  DSPLY:
01172 105762 000014             TSTB    DSW(R2)         ;DISPLAY ON?
01176 001506                    BEQ     D1              ;NO:  EXIT IMMEDIATELY
01200 016262 000016 000020      MOV     DNPTI(R2),DNPTR(R2) ;RESET NBR OF POINTS PER CALL
01206 026262 000004 000024 D5:  CMP     DPTY(R2),DENDY(R2) ;HAS Y BUFFER BEEN EXHAUSTED?
01214 101102                    BHI     D7              ;YES:  IGNORE POINT
01216 017246 000004             MOV     @DPTY(R2),-(SP) ;GET NEXT Y VALUE
01222 011637 000000G            MOV     (SP),@#LPDISY
01226 066262 000022 000004      ADD     DISINC(R2),DPTY(R2) ;BUMP TO NEXT Y
01234 105762 000015             TSTB    DSX(R2)         ;X INCREMENT OR X BUFFER DATA?
01240 001416                    BEQ     D2              ;X INCREMENT
01242 026262 000006 000026      CMP     DPTX(R2),DENDX(R2) ;HAS X BUFFER BEEN EXHAUSTED?
01250 101010                    BHI     D9              ;YES:  IGNORE POINT
01252 017246 000006             MOV     @DPTX(R2),-(SP) ;GET NEXT POINT
01256 011637 000000G            MOV     (SP),@#LPDISX   ;X BUFFER DATA
01262 066262 000022 000006      ADD     DISINC(R2),DPTX(R2) ;BUMP TO NEXT X
01270 000427                    BR      D3
01272 005726            D9:     TST     (SP)+           ;IGNORE POINT AND CLEAN UP STACK
01274 000452                    BR      D7
01276 016246 000002     D2:     MOV     DSTX(R2),-(SP)  ;GET X INCREM AND DIVIDE BY 8.
01302 016246 000006             MOV     DPTX(R2),-(SP)
01306 016246 000022             MOV     DISINC(R2),-(SP) ;GET INCREM FROM Y AND USE TO
01312 162716 000002     D12:    SUB     #2,(SP)         ;     MODIFY X.
01316 003404                    BLE     D11
01320 066266 000006 000002      ADD     DPTX(R2),2(SP)
01326 000771                    BR      D12
01330 005726            D11:    TST     (SP)+
```



```
01332 062662 000002             ADD     (SP)+,DSTX(R2)  ;UPDATE X AXIS
01336 006216                    ASR     (SP)
01340 006216                    ASR     (SP)
01342 006216                    ASR     (SP)
01344 011637 000000G            MOV     (SP),@#LPDISX   ;NOW TO THE X REGISTER
01350 022627 007777     D3:     CMP     (SP)+,#7777     ;X VALUE IN RANGE?
01354 101020                    BHI     D10             ;NO:  IGNORE POINT THEN
01356 022627 007777             CMP     (SP)+,#7777     ;HOW ABOUT THE Y POINT?
01362 101006                    BHI     D6              ;NO:  INGORE POINT
01364 052737 000001 000000G     BIS     #1,@#LPDISS     ;INTENSIFY DATA POINT
01372 105737 000000G    D4:     TSTB    @#LPDISS        ;WAIT FOR POINT TO GET UP THERE
01376 100375                    BPL     D4
01400 005362 000012     D6:     DEC     DLNPTS(R2)      ;ALL POINTS UP FOR A COMPLETE SWEEP?
01404 003406                    BLE     D7              ;YES:  RESET COUNT AND RETURN
01406 005362 000020             DEC     DNPTR(R2)       ;"N" POINTS UP BEFORE RETURNING
                                                        ;     TO CALLER?
01412 003275                    BGT     D5              ;NO:  DO ANOTHER
01414 000207            D1:     RETURN                  ;RETURN TO CALLER
01416 005726            D10:    TST     (SP)+           ;IGNORE POINT AND CLEANUP STACK
01420 000767                    BR      D6
01422 016262 000000 000004 D7:  MOV     DSTY(R2),DPTY(R2) ;RESET DISPLAY PARAMETERS AFTER EACH
                                                        ;     SWEEP.
01430 016262 000010 000012      MOV     DTNPTS(R2),DLNPTS(R2)
01436 105762 000015             TSTB    DSX(R2)         ;IF X INCREMENT ACTIVE, SET X AXIS=0.
01442 001003                    BNE     D8              ;NO
01444 005062 000002             CLR     DSTX(R2)
01450 000207                    RETURN                  ;RETURN TO CALLER NOW
01452 016262 000002 000006 D8:  MOV     DSTX(R2),DPTX(R2) ;RESET X POSITION
01460 000207                    RETURN                  ;RETURN TO CALLER NOW
                        ;
000001*                 .END                           ;END OF MODULE 4
```

SYMBOL TABLE

```
BAD    = 000010          BCDON  = ****** G        BEG    = 000000
BUFRES= ****** G         CKCMGN= ****** G        CKCOMA= ****** G
CKRPAR= ****** G         CLRD    000066RG        CLRD0   000176R
CLRD1   000202R          CLRD2   000254R         CLRD3   000250R
CLRD4   000310R          CLRD5   000442R         CLRD6   000400R
CLRD7   000356R          CONBCD= ****** G        DEL    = 000012
DENDX  = 000026          DENDY  = 000024         DIS     000554RG
DISINC= 000022           DISPAR  001010R         DISPLY  001154RG
DIS1    000572R          DIS3    000620R         DLNPTS= 000012
DNPTI  = 000016          DNPTR  = 000020         DPTX   = 000006
DPTY   = 000004          DRSNPT= ****** G        DRSON  = ****** G
DSETUP  001072R          DSET1   001134R         DSPLY   001172R
DSTX   = 000002          DSTY   = 000000         DSW    = 000014
DSX    = 000015          DTNPTS= 000010          DXY     000706RG
DXY1    000724R          D1      001414R         D10     001416R
D11     001330R          D12     001312R         D2      001276R
D3      001350R          D4      001372R         D5      001206R
D6      001400R          D7      001422R         D8      001452R
D9      001272R          END    = 000002         ENTERP= ****** G
ERBUF  = ****** G        ERNOR  = ****** G       ERRARG= ****** G
ERRPDL= ****** G         ERRSYN= ****** G        EVAL   = ****** G
FAC1   = 000040          FAC2   = 000042         FLOAT  = ****** G
FP6     000506R          FSH     000630RG        FSM1    000646R
GET    = 000006          GETADD= ****** G        GETBUF= ****** G
GETDAT= ****** G         GETNUM= ****** G        GETV   = ****** G
GETVAR= ****** G         HISTON= ****** G        INT    = ****** G
INTST  = ****** G        LPDISS= ****** G        LPDISX= ****** G
LPDISY= ****** G         LPSIP  = ****** G       LPSIVA= ****** G
MAXC    000062R          MAXD    000060R         MAXP    000064R
NARRAY= ****** G         NONRES  000030R         NUMSGN= ****** G
PC     =%000007          POLENT= ****** G        POLRET= 000134
PS     = 177776          PUSHR0  000466R         PUSH6   000474R
PUT    = 000004          PUTD    000512RG        REGSAV= ****** G
RESDIS  000000R          RESTOR= ****** G        RESTR2= ****** G
RETURN= 000207           RTSON  = ****** G       R0     =%000000
R0SAVE= 000044           R1     =%000001         R1SAVE= 000046
R2     =%000002          R2SAVE= 000050          R3     =%000003
R3SAVE= 000052           R4     =%000004         R5     =%000005
SAVER2= ****** G         SAVFAC= ****** G        SAVINT= ****** G
SP     =%000006          SS1SAV= 000024          SS2SAV= 000026
STODAT= ****** G         STORXT= ****** G        STOVAR= ****** G
TABLE  = ****** G        TRAFAC  000454R         TSTDXY  001056R
TST1    001070R          T1     = 000056         T2     = 000060
T3     = 000062          VARSAV= 000022          $DVR   = ****** G
$IR    = ****** G        $MLR   = ****** G       $POLSH= ****** G
.COMMA= ****** G         .LPAR  = ****** G       .RPAR  = ****** G

. ABS.  000000     000
        001462     001
ERRORS DETECTED: 0
FREE CORE: 17734. WORDS

LPS4,LP:=LPS4
```

6-12


```
1                .TITLE PERPAR -- PERIPHERAL SUPPORT PACKAGE PARAMETER MODULE.
2                ;
3                ; DEC-11-LBPAA-A-LA     BASIC KERNEL V02-01
4                ;
5                ; COPYRIGHT (C) 1974
6                ;
7                ; DIGITAL EQUIPMENT CORPORATION
8                ; MAYNARD, MASSACHUSETTS 01754
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21               ;
22               ; DEC ASSUMES NO RESPONSIBILITY FOR THE USE
23               ; OR RELIABILITY OF ITS SOFTWARE ON EQUIPMENT
24               ; WHICH IS NOT SUPPLIED BY DEC.
25
26               ; THE CONDITIONALS CONTAINED IN THIS MODULE AFFECT THE ASSEMBLY
27               ; OF THE FUNCTION TABLE MODULE "FTBL.MAC".
28               ; TO OBTAIN THE DESIRED CONDITIONAL DEFINITION(S),
29               ; REMOVE (USING AN EDITOR) THE
30               ; SEMI-COLON APPEARING BEFORE THE CONDITIONAL.
31               ;$DISK=0                ;DEFINE FOR RT-11
32                       .IFNDF $DISK
33      000000 $STRNG=0                  ;DO NOT DEFINE FOR PTS BASIC WITHOUT
34                                       ;STRINGS,- DEFINED FOR PTS V01 WITH STRINGS
35                       .ENDC           ;
36
37      000000 $LPS=0                    ;DEFINE FOR LPS
38                       .IFDF $LPS
39               ;$V=0                   ;DEFINE FOR LPS WITH VECTORS STARTING
40                       ;               ;    AT 300.  DEFAULT SETTING IS VECTORS AT
41                       ;               ;    340, SET $V = ANY OTHER DISPLACEMENT IF
42                       ;               ;       VECTORS START AT DISPLACEMENTS
43                       ;               ;       OTHER THAN 0 OR 40 FROM
44                       ;               ;       VECTOR 300
45
46      000000 $ADC=0                    ;INCLUDE A/D ROUTINES.
47      000000 $CLK=0                    ;INCLUDE CLOCK ROUTINES.
48      000000 $DIO=0                    ;INCLUDE DIGITAL IO ROUTINES
49      000000 $DIS=0                    ;INCLUDE DISPLAY ROUTINES.
50                       .ENDC   ;$LPS
51               ;
52               ;
53      000000 $VT11=0                   ;FOR GT40 (GT44)
54               ;
55               ;
56
57
```

52

```
                        .IFDF   $VT11
000000 $CLOCK=0                         ;FOR SYSTEM CLOCK (KW11L)
                        .ENDC

                        .EOT
                .TITLE  GTB  V01-01 BASIC - GT ROOT MODULE
                ;
                ;       DEC - 11 - LBPGB - A - LA     BASIC KERNEL V02-01
                ;
                ;       GTB.MAC TAPE 1 OF 4
                ;
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                ; COPYRIGHT (C) 1973,1974, BY DIGITAL EQUIPMENT CORPORATION.
                ;
                ;       AUTHOR: DR. STEPHEN R. ALPERT   AUGUST 1973
                        .IFDF   $DISK
                        .SBTTL  GLOBALS, EQUATES
                        .ENDC

000000                  $LPS=0          ; TAKEN CARE OF BY GTNLPS
                        .IFDF   $LPS
                        .GLOBL  NARRAY,TABLE,FLOAT
                        .ENDC
                        .IFNDF  $DEPTH
                        $DEPTH=10.              ; 10. CALLS DEFAULT
                        .ENDC

                        ; GLOBAL FROM BASICH OR BASICL FOR INTERRUPT
                        .GLOBL  USRAREA

                        ; GLOBALS FROM BASICL

                        .GLOBL  DSTOP,DISEND,ACTEND,BEG
                        .GLOBL  DCRASH,WD1,WD2,OLDMOD
                        .GLOBL  ,COMMA,,LPAR,,RPAR,,EOL
                        .GLOBL  EVAL,ERRSYN,ERRARG,INT
                        .GLOBL  GETVAR,STOVAR
                        .GLOBL  NUMOUT,MSG
                        .IFDF   $DISK
                        .GLOBL  IGNORE
                        .ENDC

                        ; GLOBALS FROM FPMP
```



```
                        .GLOBL $IR,$MLR,$DVR,$ADR,$SBR,$ERVEC

                        ; GLOBALS FOR INTER-MODULE COMMUNICATION
                        .GLOBL  NSTSK,INSRTF,TAG1,ACTST,DISEND
                        .GLOBL  SCAL,VECT,RDOT,APNT,STAT,TEXT
                        .GLOBL  ON,OFF,NOSC,TAGEND,ADSTK,BUFTST
                        .GLOBL  SUBP,ESUB,LPEN,TRAK,ERAS,CONTA,CKEOL
                        .GLOBL  INIT,INITA,DSTP,STOPA,CONT,XGRA,YGRA,AGET,APUT
                        .GLOBL  FIGR,FPUT,FIX0,FIX3P,FIX
                        .GLOBL  DPC,DSR,DISX,DISY,GTVECT
                        .IFDF   $CLOCK
                        .GLOBL  TIME,TIMR
                        .ENDC
                        .IFDF   $DISK
                        .GLOBL  SAV24,SAVERT,CLOSALL,FREE0,FREE
                        .ENDC
                        .GLOBL  SC,USC,TAGSRH,SCL.X,SCL.Y,ABS.F

                        ; EQUATES FROM BASIC USER AREA

000022                  VARSAV=22
000024                  SS1SAV=24
000026                  SS2SAV=26
000040                  FAC1=40
000042                  FAC2=42
000010                  ARRAYS=10
000012                  HIFREE=12
000014                  LOFREE=14
000044                  R0SAVE=44       ; FOR FPPSAV, FPPRES
                ;       THE FOLLOWING DEFINITION PAIR IS LEGITIMATE (IE, NOT
                ;IN THE VECTOR DEFINITION MODULE ["PERVEC"]) SINCE THEY
                ;ARE FIXED, THEY CANNOT FLOAT.
                        .IFDF   $CLOCK
000100 LKV=100          ;CLOCK INTERRUPT ADRESS.
177546 LKS=177546       ;CLOCK STATUS REGISTER
                        .ENDC   ;$CLOCK


                ;       THE FOLLOWING IS TO INSURE THAT THE ORIGINAL
                ;       STACK POINTER DOESN'T CLOBBER ANYTHING IMPORTANT
                        .IFDF   $DISK
                        .ASECT
                        .=42
                        .WORD   DCRASH+400      ; REPLACE 24000 IN BASIC
                        .CSECT
                        .ENDC

                        .IFDF   $DISK
```

```
1                       .SBTTL  ASSIGNMENTS
2                       .ENDC
3               ;       ****************************************
4
5                       ; REGISTER ASSIGNMENTS
6       000000          R0=%0
7       000001          R1=%1
8       000002          R2=%2
9       000003          R3=%3
10      000004          R4=%4
11      000005          R5=%5
12      000006          SP=%6
13      000007          PC=%7
14
15                      ; MISCELLANEOUS ASSIGNMENTS
16      177776          PSW=-2          ; PROCESSOR STATUS WORD
17      000207          RETURN=207      ; = RTS PC
18      000134          POLRET=134      ; = JMP @(R4)+
19      000200          PR4=200         ; PRIORITY 4
20      000340          PR7=340         ; PRIORITY 7
21
22      160000          DJMP=160000     ; DISPLAY JMP
23      173400          SDINT=173400    ; STOP DISPLAY AND INTERRUPT 11
24
25                      .IFDF   $DISK
```



```
1                       .SBTTL  MISCELLANEOUS ROUTINES
2                       .ENDC
3               ;       ****************************************
4                       ; MISCELLANEOUS ROUTINES
5
6  000000       SAVINT:
7  000000 016546        MOV     FAC2(R5),-(SP)  ; SAVE 1-WORD INTEGER
          000042
8  000004 000134        POLRET                  ; = JMP @(R4)+
9
10              ;       ****************************************
11
12                      ; ROUTINE TO INTEGERIZE THE FAC TO A SINGLE WORD
13                      ; INTEGER, WILL CRASH IF ARGUMENT TOO LARGE
14                      ; RESULT ALSO IN FAC, DESTROYS R0
15
16 00006        INTEGR:
17 00006 004767        JSR     PC,INT          ; GO TO "INT" OF BASICL
          000000G
18 00012 005765        TST     FAC1(R5)        ; DID WE SUCCEED?
          000040
19 00016 001001        BNE     INTEG0          ; BR IF > 32767
20 00020 000134        POLRET
21 00022 000167 INTEG0: JMP     ERRARG          ; ARGUMENT ERROR, TOO LARGE
          000000G
22
23              ;       ****************************************
24
25 00026        PLOOP:
26 00026 012467        MOV     (R4)+,LOOPCT    ; GET COUNT, (NOT REENTRANT)
          000022
27 00032 010467        MOV     R4,LPADR        ; SAVE LOOP ADDRESS
          000020
28 00036 000134        POLRET
29 00040        ELOOP:
30 00040 005367        DEC     LOOPCT          ; DECREMENT LOOP COUNT
          000010
31 00044 003402        BLE     ELOOP0          ; BR IF DONE
32 00046 016704        MOV     LPADR,R4        ; GET LOOP ADDRESS
          000004
33 00052 000134 ELOOP0: POLRET
34
35 00054 000000 LOOPCT: .WORD 0                 ; NUMBER OF TIMES TO LOOP
36 00056 000000 LPADR:  .WORD 0                 ; ADR OF START OF LOOP
37
```

```
1                       ;       ****************************************
2
3 000060                SETNEC:
4 000060 005067         CLR     OPARGF          ; CLEAR OPTIONAL ARG, FLAG
         000010
5 000064 000134         POLRET
6 000066                SETOPT:
7 000066 010667         MOV     SP,OPARGF       ; SET OPTIONAL ARG, FLAG
         000002
8 000072 000134         POLRET
9
10 00074 000000 OPARGF: .WORD 0                 ; OPTIONAL ARGUMENT FLAG (=1 IF OPT)
11
12                      ;       ****************************************
13
14                      ; ROUTINE TO CK "," AND GET NEXT ARGUMENT INTO THE FAC
15                      ; IF OPTIONAL ARGUMENT FLAG IS SET AND ARGUMENT IS NOT
16                      ; PRESENT, 0 WILL BE RETURNED.
17                      ; BECAUSE OF "EVAL" FROM BASICL, USES ALL REGISTERS
18                      ; ON ENTRY: R1 MUST POINT TO WHERE COMMA SHOULD BE.
19                      ; *** NOTE THAT R4 HERE IS POLISH PC AND NOT THE
20                      ;       STACK SIZE THAT EVAL EXPECTS!!
21
22 00076                GETNUM:
23 00076 112102         MOVB    (R1)+,R2        ; GET NEXT TOKEN?
24 00100 120227         CMPB    R2,#',COMMA     ; IS IT A COMMA?
         000000G
25 00104 001414         BEQ     GETONE          ; YES- GET A NUMBER
26 00106 005767         TST     OPARGF          ; NO- WAS ARG. OPTIONAL?
         177762
27 00112 001415         BEQ     GETSYN          ; NO- ERROR
28 00114 120227         CMPB    R2,#',RPAR      ; YES- IS IT A ")" ?
         000000G
29 00120 001012         BNE     GETSYN          ; NO- ERROR
30 00122 005301         DEC     R1              ; YES- POINT AT IT
31 00124 005065 ZERNUM: CLR     FAC1(R5)
         000040
32 00130 005065         CLR     FAC2(R5)        ; PUT 0 INTO FAC
         000042
33 00134 000134         POLRET
34 00136                GETONE:
35 00136 004767         JSR     PC,EVAL         ; EVALUATE EXPRESSION
         000000G
36 00142 103403         BCS     GETARG          ; ERROR IF STRING
37 00144 000134         POLRET
38 00146 000167 GETSYN: JMP     ERRSYN          ; SYNTAX ERROR
         000000G
39 00152 000167 GETARG: JMP     ERRARG          ; ARGUMENT ERROR
         000000G
40
41                      ;       ****************************************
42
43                      ; IMMEDIATE POLISH FOR ONE ROUTINE
44
45 00156                ENTERP:
46 00156 012704         MOV     #RETURP,R4
         000166'
```



```
47 00162 017607         MOV     @(SP),PC        ; GO TO ROUTINE
         000000
48 00166 000170'RETURP: .+2                     ; RETURN HERE FROM ROUTINE
49 00170 062716         ADD     #2,(SP)         ; ADJUST FOR POLRET
         000002
50 00174 000207         RETURN
51
52                      ;       ****************************************
53
54 00176                NEGSTK:
55 00176 062716         ADD     #100000,(SP)    ; NEGATE STACK
         100000
56 00202 000134         POLRET
57
58                      ;       ****************************************
59
60                      ; ROUTINE TO TEST IF BUFFER ALLOCATED
61
62 00204 012746 BUFPOL: MOV     #POLENT,-(SP)   ; FAKE JSR PC
         000270'
63 00210                BUFTST:
64 00210 005767         TST     DCRASH          ; BUFFER ALLOCATED?
         010376
65 00214 001404         BEQ     BUFT0           ; NO- DO IT
66 00216 026727         CMP     DISEND,#-1      ; INIT BEEN DONE?
         000414
         177777
67 00224 001002         BNE     .+6             ; YES- BRANCH
68 00226 004767 BUFT0:  JSR     PC,INITA        ; INIT AND ALLOCATE BUFFER
         002252
69 00232 000207         RETURN
70
71 00234                PUSH:
72 00234 016546         MOV     FAC2(R5),-(SP)
         000042
73 00240 016546         MOV     FAC1(R5),-(SP)  ; PUSH FAC TO STACK
         000040
74 00244 000134         POLRET
75 00246                PUSH1:
76 00246 005046         CLR     -(SP)
77 00250 012746         MOV     #40200,-(SP)    ; PUT 1.0 ON STACK
         040200
78 00254 000134         POLRET
79 00256                POP:
80 00256 012665         MOV     (SP)+,FAC1(R5)
         000040
81 00262 012665         MOV     (SP)+,FAC2(R5)  ; POP STACK TO FAC
         000042
82 00266 000134         POLRET
```

```
                        ;       ****************************************
                        ;
                        ; ROUTINE TO START POLISH AND CHECK FOR LEFT PAREN.
                        ;
000270          POLENT:
000270 012604           MOV     (SP)+,R4        ; SET UP POLISH PC
000272 005067           CLR     OPARGF          ; SET ARG, NECESSARY FLAG
        177576
000276 122127 CKLPAR:   CMPB    (R1)+,#.LPAR    ; FIRST TOKEN A "(" ?
        000000G
000302 001001           BNE     CKLSYN          ; NO- ERROR
000304 000134           POLRET
000306 000167 CKLSYN:   JMP     ERRSYN          ; SYNTAX ERROR
        000000G
                        ;
00312           QIKPOL:
00312 012604            MOV     (SP)+,R4        ; SET UP POLISH PC
00314 000134            POLRET                  ; AND ENTER POLISH MODE
                        ;
                        ;       ****************************************
                        ;
                        ; GENERAL EXIT ROUTINE WHICH CHECKS FOR RIGHT PAREN
                        ; CALLED BY :  JMP CKRPAR
                        ;
00316           CKRPAR:
00316 122127            CMPB    (R1)+,#.RPAR    ; A RIGHT PAREN?
        000000G
00322 001004            BNE     CKRPA0          ; BR IF NOT
00324           CKEOL:
00324 121127            CMPB    (R1),#.EOL      ; AND END-OF LINE?
        000000G
00330 001001            BNE     CKRPA0          ; NO- ERROR
00332           GETOUT:
                        .IFDF   $DISK
                        TST     (SP)+           ; CLEAN STACK
                        MOV     (SP)+,R5
                        MOV     (SP)+,R4
                        MOV     (SP)+,R1        ; RESTORE BASIC REGISTERS
                        JMP     IGNORE          ; EXIT THRU BASICR
                        .ENDC
                        .IFNDF  $DISK
00332 000207            RETURN
                        .ENDC
00334 000167 CKRPA0:    JMP     ERRSYN          ; SYNTAX ERROR
        000000G
                        ;
                        ;       ****************************************
                        ;
                        ; ROUTINE TO SKIP AN ARGUMENT IN CALLING SEQUENCE
                        ; R1 POINTS TO FIRST TOKEN OF ARGUMENT AND ROUTINE
                        ; SEARCHES FOR A ".COMMA", EXIT POINTING TO ","
                        ;
00340           SKPARG:
00340 010046            MOV     R0,-(SP)        ; SAVE R0 ON STK
00342 005000            CLR     R0              ; ASSUME NO PARENTHESES
00344 005700 SKPA3:     TST     R0              ; ANY PARENTHESES YET?
00346 001003            BNE     SKPA4           ; YES- BRANCH
```



```
00350 121127            CMPB    (R1),#.COMMA    ; DID WE FIND A COMMA?
        000000G
00354 001416            BEQ     SKPA0           ; YES- EXIT
00356 121127 SKPA4:     CMPB    (R1),#.LPAR     ; A "("?
        000000G
00362 001001            BNE     SKPA1           ; NO- KEEP LOOKING
00364 005200            INC     R0              ; YES- INCREMENT NEST DEPTH
00366 121127 SKPA1:     CMPB    (R1),#.RPAR     ; A ")"?
        000000G
00372 001002            BNE     SKPA2           ; NO- BRANCH
00374 005300            DEC     R0              ; DECREMENT NEST COUNT
00376 100405            BMI     SKPA0           ; BRANCH IF EXTRA ")"
00400 122127 SKPA2:     CMPB    (R1)+,#.EOL     ; END OF LINE ?
        000000G
00404 001357            BNE     SKPA3           ; NO- LOOK SOME MORE
00406 000167            JMP     ERRSYN          ; YES- ERROR
        000000G
00412 012600 SKPA0:     MOV     (SP)+,R0        ; RESTORE R0
00414 000134            POLRET                  ; RETURN IN POLISH
                        ;
                        ;
                        ;       POLISH REGISTER SAVE AND RESTORE
                        ; FPPSAV CALLED BY JSR R4
                        ; FPPRES CALLED IN POLISH MODE
                        ;
00416           FPPSAV:
00416 062705            ADD     #R0SAVE,R5      ; POINT TO SAVE AREA
        000044
00422 010025            MOV     R0,(R5)+
00424 010125            MOV     R1,(R5)+
00426 010225            MOV     R2,(R5)+
00430 010325            MOV     R3,(R5)+
00432 012625            MOV     (SP)+,(R5)+
00434 162705            SUB     #R0SAVE+12,R5
        000056
00440 000134            POLRET                  ; ENTER POLISH MODE
                        ;
00442           FPPRES:
00442 062705            ADD     #R0SAVE,R5
        000044
00446 012500            MOV     (R5)+,R0
00450 012501            MOV     (R5)+,R1
00452 012502            MOV     (R5)+,R2
00454 012503            MOV     (R5)+,R3
00456 012546            MOV     (R5)+,-(SP)
00460 162705            SUB     #R0SAVE+12,R5
        000056
00464 000204            RTS     R4              ; RETURN IN EXEC MODE
                        ;
                        .IFDF   $DISK
```

```
1                       .SBTTL  STOP DISPLAY INTERRUPT ROUTINE
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO PROCESS "SDINT" FROM DPU
6                       ;  CASE 1: CALL TO SUBPICTURE, THEN CONTENTS OF X
7                       ;          (IN DPC) ARE GREATER THAN X+2
8                       ;       X IS THE ADDRESS OF THE WORD AFTER "SDINT"
9                       ;  CASE 2: EXIT FROM SUBP, THEN CONTENTS OF X = 0
10                      ;  CASE 3: ADD ON AT END OF FILE, THEN
11                      ;          CONTENTS OF X < X+2
12
13 00466          DISINT:
14 00466 022767         CMP     #DSTOP,DPC      ; DID WE STOP IN TIGHT LOOP?
         010610'
         000000G
15 00474 001004         BNE     DIS0            ; NO- CONTINUE
16 00476 012767         MOV     #DJMP,DSTOP-2   ; RESTORE FILE
         160000
         010102
17 00504 000002         RTI                     ; YES- DON'T RESTART IT, EXIT
18 00506 010046 DIS0:   MOV     R0,-(SP)        ; SAVE R0
19 00510 010246         MOV     R2,-(SP)        ; SAVE R2
20 00512 016700         MOV     DPC,R0          ; WHERE DID DPU STOP?
         000000G
21 00516 012002         MOV     (R0)+,R2        ; R2 CONTAINS CONTENTS OF X
22                                              ; R0 CONTAINS X+2
23 00520 001414         BEQ     SUB0            ; BR IF CASE 2: END OF SUBPICTURE
24 00522 020002         CMP     R0,R2           ; COMPARE X+2 WITH (X)
25 00524 101022         BHI     SUB2            ; BR IF CASE 3: ADD TO DPY FILE
26 00526 062767         ADD     #2,ADSTK        ; INCREMENT DPY ADR STK PTR
         000002
         000626
27 00534 010077         MOV     R0,@ADSTK       ; STORE X+2 IN STACK
         000622
28 00540 011067         MOV     (R0),DPC        ; START DPC GOING IN SUBPICTURE
         000000G
29 00544 012602 SUB1:   MOV     (SP)+,R2        ; RESTORE R2
30 00546 012600         MOV     (SP)+,R0        ; RESTORE R0
31 00550 000002         RTI                     ; AND RETURN FROM INTERRUPT
32 00552 017700 SUB0:   MOV     @ADSTK,R0       ; PUT X+2 INTO R0
         000604
33 00556 162767         SUB     #2,ADSTK        ; DECREMENT DPY ADR STK PTR
         000002
         000576
34 00564 014067         MOV     -(R0),DPC       ; PUT (X) INTO DPC
         000000G
35 00570 000765         BR      SUB1            ; AND EXIT
36 00572 016740 SUB2:   MOV     WD2,-(R0)       ; INSERT WORD 2
         000144
37 00576 016740         MOV     WD1,-(R0)       ; INSERT WORD 1
         000136
38 00602 016700         MOV     DISEND,R0       ; GET NEW END OF DPY FILE +2
         000030
39 00606 005740         TST     -(R0)           ; POINT AT ACTUAL END
40 00610 010067         MOV     R0,ACTEND       ; STORE IT
         000024
```



```
41 00614 005740         TST     -(R0)           ; POINT TO NEW DISEND
42 00616 010067         MOV     R0,DISEND       ; STORE IT
         000014
43 00622 005067         CLR     INSRTF          ; CLEAR INSERT PENDING FLAG
         000006
44 00626 004767         JSR     PC,INIT3        ; RESUME THE DPU
         002036
45 00632 000744         BR      SUB1            ; AND EXIT
46
47 00634 000000 INSRTF: .WORD 0                 ; INSERT PENDING FLAG (WHEN SET)
48 00636 177777 DISEND: .WORD -1                ; POINTER TO NEW SLOT IN DPY FILE
49 00640 000000 ACTEND: .WORD 0                 ; POINTS TO END OF RUNNING DPY FILE
50 00642 000000 ACTST:  .WORD   0               ; LO-END OF DPY FILE
51                                              ; PRECEDED BY 1 OR 2 WORDS
52                                              ; (2 IF $DISK DEFINED)
53                      .IFDF   $DISK
54
```

```
                        .SBTTL  INSERTION INTO DPY FILE ROUTINES
                        .ENDC
                ;       ************************************

                        ; ROUTINE TO INSERT WORDS INTO DPY FILE. THE FIRST TWO WORDS
                        ; ARE SAVED IN WD1, AND WD2, TO OVERLAY THE LAST TWO ENTRIES
                        ; IN THE RUNNING DISPLAY FILE.
                        ; CALLED BY: JSR  PC,PUTWD
                        ;   WORD TO BE INSERTED MUST BE IN R0


001644                  NEWPUT:
001644 005067 001114            CLR     OLDMOD          ; SO NEXT SGM WILL BE INSERTED
001650                  PUTWD:
001650 010246                   MOV     R2,-(SP)        ; SAVE R2 ON STK
001652 012702 000636'   PUT5:   MOV     #DISEND,R2      ; GET CURRENT END OF DPY FILE
001656 026712 007730            CMP     DCRASH,(R2)     ; END OF DPY FILE
001662 103003                   BHIS    PUT7            ; NO= CONTINUE
001664                  DFOERR:
001664 104400                   TRAP    0
                                .IFNDF  $LONGER
001666 104                      .ASCII  /DFO/
001667 106
001670 117
                                .ENDC
                                .IFDF   $LONGER
                                .ASCII  /DISPLAY FILE OVERFLOW/
                                .ENDC
001671 000                      .BYTE   0
                                .EVEN
001672 005767 177736 PUT7:      TST     INSRTF          ; IS THERE AN INSERT PENDING?
001676 001375                   BNE     PUT7            ; YES= WAIT UNTIL IT IS FREE
001700 026712 177734 PUT6:      CMP     ACTEND,(R2)     ; HAVE WE INSERTED ANY WORDS YET?
001704 101007                   BHI     PUT1            ; NO= STORE IN WD1
001706 001411                   BEQ     PUT2            ; YES= ONE= STORE IN WD2
001710 010072 000000            MOV     R0,0(R2)        ; MORE THAN TWO, PUT IT IN LINE.
001714 062712 000002 PUT3:      ADD     #2,(R2)         ; INCREMENT DPY END PTR
001720 012602                   MOV     (SP)+,R2        ; RESTORE R2
001722 000207                   RETURN                  ; EXIT
001724 010067 000010 PUT1:      MOV     R0,WD1          ; STORE IN WORD 1
001730 000771                   BR      PUT3            ; AND EXIT
001732 010067 000004 PUT2:      MOV     R0,WD2          ; STORE IN WORD 2
001736 000766                   BR      PUT3            ; AND EXIT

001740 000000 WD1:      .WORD 0                         ; FIRST TEMPORARY WORD
001742 000000 WD2:      .WORD 0                         ; SECOND TEMPORARY WORD FOR DPY FILE

                ;       ************************************
```



```

                        ; ROUTINE TO SET UP THE INSERT INTO THE DPY FILE.
                        ; THIS ROUTINE WILL BE CALLED BY EACH ROUTINE AFTER IT
                        ; HAS DONE ALL OF ITS "PUTWD", IT IS USUALLY FOLLOWED BY
                        ; A JUMP TO CKRPAR.  CALLED BY:  JSR PC, INSERT

001744                  INSERT:
001744 005777 000442            TST     @NSTSK          ; HOW ARE WE DOING ON SUBP?
001750 001015                   BNE     INSXIT          ; NOT 0= STILL IN A SUBP
001752 012700 160000            MOV     #DJMP,R0        ; PUT DJMP INTO R0
001756 004767 177666            JSR     PC,PUTWD        ; STORE AT END OF DPY FILE
001762 016702 177652            MOV     ACTEND,R2       ; GET LOOP ADDRESS
001766 011200                   MOV     (R2),R0         ; KEEP THE POINTER TOO
001770 004767 177654            JSR     PC,PUTWD        ; STORE IT AT NEW END OF DPY FILE
001774 010667 177634            MOV     SP,INSRTF       ; SET INSERT PENDING FLAG
002000 012742 173400            MOV     #SDINT,-(R2)    ; PUT SDINT AT OLD END
002004 000207           INSXIT: RETURN                  ; = RTS PC
                                .IFDF   $DISK
```

```
1                       .SBTTL  "SUBP" ROUTINE
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE:
6                       ;       CALL "SUBP" (T [,T1])
7
8 001006        SUBP:
9 001006 004767         JSR     PC,BUFPOL       ; ENTER POLISH AND CHECK "("
         177172
10 01012 000136'                +GETONE         ; GET FIRST PARAMETER
11 01014 000006'                +INTEGR         ; INTEGERIZE TO 32767 OR LESS
12 01016 000000'                +SAVINT         ; SAVE INTEGER ON STACK
13 01020 000066'                +SETOPT         ; T1 IS OPTIONAL ARGUMENT
14 01022 000076'                +GETNUM         ; CHK "," AND GET T1 (ELSE 0)
15 01024 000006'                +INTEGR         ; INTEGERIZE TO 32767 OR LESS
16 01026 000000'                +SAVINT         ; SAVE T1 ON THE STACK
17 01030 001032'                .+2             ; AND EXIT FROM POLISH MODE
18 01032 002002                 BGE     SUBP0           ; BR IF T1 >= 0
19 01034 000167 SUBP1:  JMP     ERRARG          ; ARGUMENT ERROR
         000000G
20 01040 016602 SUBP0:  MOV     2(SP),R2        ; MOVE T TO R2
         000002
21 01044 003773                 BLE     SUBP1           ; BR IF T <= 0
22 01046 004767                 JSR     PC,TAGSRH       ; LOOK FOR T IN FILE, BETTER NOT FIND IT
         000342
23 01052 005700                 TST     R0
24 01054 001367                 BNE     SUBP1           ; ERROR- TAG ALREADY IN USE
25 01056 012700                 MOV     #SDINT,R0
         173400
26 01062 004767                 JSR     PC,PUTWD        ; PUT IN SDINT FOR SUBP CALL
         177562
27 01066 016700                 MOV     DISEND,R0
         177544
28 01072 062700                 ADD     #10,R0          ; ADR OF THE SUBP
         000010
29 01076 012602                 MOV     (SP)+,R2        ; PUT T1 INTO R2
30 01100 011646                 MOV     (SP),-(SP)      ; MOVE T DOWN ONE PLACE
31 01102 010266                 MOV     R2,2(SP)        ; PUT T1 BACK ON STK
         000002
32 01106 001022                 BNE     SUBP2           ; BR IF 2 PARAMETER CASE
33 01110 005020                 CLR     (R0)+           ; ZERO WORD BEFORE SUBP
34 01112 062767                 ADD     #2,NSTSK        ; ADD 2 TO CALL SUBP PTR
         000002
         000272
35 01120 022767                 CMP     #NSTSK,NSTSK    ; ARE WE POINTING TO OURSELVES?
         001412'
         000264
36 01126 101407                 BLOS    NSTERR          ; YES- OVERFLOW STACK DEPTH
37 01130 016777                 MOV     DISEND,@NSTSK   ; NO- SAVE PTR FOR REST-OF-FILE PTR
         177502
         000254
38 01136 062767                 ADD     #2,DISEND       ; BUMP PTR PAST THAT WORD
         000002
         177472
39 01144 000413                 BR      SUBP3           ; CONTINUE
40
```



```
41 01146        NSTERR:
42 01146 104400                 TRAP    0
43                              .IFNDF  $LONGER
44 01150    111                 .ASCII  /INS/
   01151    116
   01152    123
45                              .ENDC
46                              .IFDF   $LONGER
47                              .ASCII  /IMPROPERLY NESTED SUBPICTURES/
48                              .ENDC
49 01153    000                 .BYTE   0
50                              .EVEN
51
52 01154 004767 SUBP2:  JSR     PC,PUTWD        ; PTR TO REST OF FILE
         177470
53 01160 004767                 JSR     PC,TAGSRH       ; FIND T1, HOPEFULLY
         000230
54 01164 005700                 TST     R0
55 01166 001722                 BEQ     SUBP1           ; FAILED TO FIND IT- ARG, ERROR
56 01170 016000                 MOV     -4(R0),R0       ; GET START ADR OF SUBP
         177774
57 01174 004767 SUBP3:  JSR     PC,PUTWD        ; PUT ADR INTO DPY FILE
         177450
58 01200 016777                 MOV     DISEND,@TAGEND  ; UPDATE TAG LIST
         177432
         000230
59 01206 012600                 MOV     (SP)+,R0        ; GET TAG T
60 01210 004767                 JSR     PC,PUTWD        ; INSERT IT INTO DPY FILE
         177434
61 01214 016767                 MOV     DISEND,TAGEND   ; FIX PTR TO END OF LIST
         177416
         000214
62 01222 005000                 CLR     R0
63 01224 004767                 JSR     PC,NEWPUT       ; NEXT TAG PTR=0/ NEW SGM
         177414
64 01230 004767                 JSR     PC,INSERT       ; INSERT IF 2-PARAM CALL
         177510
65 01234 012600                 MOV     (SP)+,R0        ; GET T1 AGAIN
66 01236 001002                 BNE     .+6             ; 2 PARAM, CASE- BRANCH
67 01240 004767                 JSR     PC,PUTWD        ; ELSE INSERT A ZERO
         177404
68 01244 000167                 JMP     CKRPAR          ; AND EXIT
         177046
69                              .IFDF   $DISK
```

```
1                       .SBTTL  "ESUB" ROUTINE
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE:
6                       ;       CALL "ESUB"
7
8 001250        ESUB:
9 001250 004767         JSR     PC,BUFTST       ; ANY BUFFER YET?
         176734
10 01254 012700         MOV     #SDINT,R0       ; PUT SDINT INTO R0
         173400
11 01260 004767         JSR     PC,PUTWD        ; INSERT AT END OF DPY FILE
         177364
12 01264 005000         CLR     R0
13 01266 004767         JSR     PC,PUTWD        ; FOLLOWED BY A 0
         177356
14 01272 016700         MOV     DISEND,R0       ; SAVE DISEND AND USE IT TOO
         177340
15 01276 017767         MOV     @NSTSK,DISEND   ; WHERE TO PUT IT
         000110
         177332
16 01304 001720         BEQ     NSTERR          ; TOO MANY ESUBS IF = 0
17 01306 004767         JSR     PC,NEWPUT       ; INSERT INTO DPY FILE/ NEW SGM
         177332
18 01312 010067         MOV     R0,DISEND       ; STORE DISEND
         177320
19 01316 162767         SUB     #2,NSTSK        ; DROP CALL PTR BY 2
         000002
         000066
20 01324 004767         JSR     PC,INSERT       ; CAN INSERT NOW
         177414
21 01330 000167 ESXIT:  JMP     CKEOL           ; EXIT TO USER
         176770
22
23              ; THE STACK DEPTH OF SUBP IS AN ASSEMBLY
24              ; PARAMETER INSTEAD OF DEFAULTING TO A VALUE OF 10
25              ; *** IT IS THE PARAMETER, $DEPTH
26              ; $DEPTH INCLUDES CALLS TO 2 PARAMETER SUBP
27
28              ;       ****************************************
29
30                      ; STORAGE FOR POINTERS IN SUBP AND ESUB
31
32 01334 000000 ADBAS:  .WORD 0                 ; WORD TO DETECT BOTTOM OF DPY STK
33      001362'         .=.+$DEPTH+$DEPTH
34 01362 000000 ADSTK:  .WORD 0                 ; POINTER TO DPY STACK
35 01364 000000 NSBAS:  .WORD 0                 ; WORD TO DETECT BOTTOM OF NEST
36      001412'         .=.+$DEPTH+$DEPTH
37 01412 000000 NSTSK:  .WORD 0                 ; POINTER TO NEST STACK
38                      .IFDF   $DISK
```



```
1                       .SBTTL  MISCELLANEOUS ROUTINES
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO FIND A GIVEN TAG (PASSED IN R2)
6                       ; ON EXIT R0 = 0 IF TAG NOT FOUND
7                       ; ELSE
8                       ; R0 POINTS TO THE PTR FOLLOWING THE TAG
9                       ; R3 POINT TO THE PTR POINTING TO THE TAG
10                      ;  CALLED BY JSR  PC,TAGSRH
11                      ;  R0 AND R3 ARE CHANGED, R2 NOT CHANGED
12
13 01414        TAGSRH:
14 01414 016700         MOV     TAGHED,R0       ; GET START ADR OF TAG LIST
         000014
15 01420 022002 TGLOOP: CMP     (R0)+,R2        ; DO TAGS MATCH?
16 01422 001403         BEQ     TAGXIT          ; YES- EXIT
17 01424 010003         MOV     R0,R3           ; R1 POINTS TO PTR POINTING TO TAG
18 01426 011000         MOV     (R0),R0         ; GET ADR OF NEXT PTR
19 01430 001373         BNE     TGLOOP          ; LOOP IF NOT AT END OF LIST
20 01432 000207 TAGXIT: RETURN
21
22 01434 010514'TAGHED: .WORD TAG1              ; POINTER TO FIRST TAG
23 01436 000000 TAGEND: .WORD 0                 ; POINTER TO PTR AFTER LAST TAG
24
25              ;       ****************************************
26
27                      ; POLISH ROUTINE TO TEST IF R0 < 64
28                      ; XYBIG IS INCREMENTED IF IT IS >= 64
29                      ; USED IN ARGGET AND OTHER PLACES
30                      ; SAVE IT ON THE STACK
31
32 01440        TST64:
33 01440 020027         CMP     R0,#100         ; COMPARE WITH 64
         000100
34 01444 002402         BLT     SAVER0          ; BR IF < 64
35 01446 005267         INC     XYBIG           ; INCREMENT COUNTER OF BIG VALUES
         000356
36 01452        SAVER0:
37 01452 010046         MOV     R0,-(SP)        ; SAVE R0 ON THE STACK
38 01454 000134         POLRET                  ; RETURN IN POLISH
39                      .IFDF   $DISK
40                      .EOT
```

```
                        ;
                        ;       DEC - 11 - LBPGB - A - LA     BASIC KERNEL V02-01
                        ;
                        ;       GTB,MAC TAPE 2 OF 4
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                                .SBTTL  "ERAS" ROUTINE
                                .ENDC
                        ;       ****************************************

                                ; ROUTINE TO HANDLE
                                ;       CALL "ERAS" [(T)]
                                ;  IF T IS NOT SPECIFIED, THEN ERASE TRAK

01456                   ERAS:
01456 004767                    JSR     PC,BUFTST       ; ANY BUFFER YET?
      176526
01462 121127                    CMPB    (R1),#,EOL      ; END OF THE LINE?
      000000G
01466 001005                    BNE     ERAS0           ; NO - GET T
01470 012767                    MOV     #DJMP,BEG       ; DJMP OVER TRAK
      160000
      007010
01476 000167                    JMP     CKEOL           ; EXIT TO USER
      176622
01502 004767            ERAS0:  JSR     PC,POLENT       ; ENTER POLISH MODE AND CHECK "("
      176562
01506 000136'                   +GETONE                 ; GET T
01510 000006'                   +INTEGR                 ; INTEGERIZE TO 32767 OR LESS
01512 001514'                   .+2                     ; EXIT POLISH
01514 016502                    MOV     FAC2(R5),R2     ; GET T AS AN INTEGER
      000042
01520 003002                    BGT     ERAS2           ; BR IF T LEGAL
01522 000167            ERAS1:  JMP     ERRARG          ; ARGUMENT ERROR IF T<=0
      000000G
01526 004767            ERAS2:  JSR     PC,TAGSRH       ; FIND THE TAG IN DPY FILE
      177662
01532 005700                    TST     R0              ; DID WE SUCCEED?
01534 001772                    BEQ     ERAS1           ; ARG, ERROR IF CAN'T FIND IT
01536 012760                    MOV     #DJMP,-10(R0)   ; REPLACE SDINT BY DJMP
```



```
      160000
      177770
01544 005060                    CLR     -2(R0)          ; MAKE THE TAG ZERO - FOR "SAVE"
      177776
01550 016002                    MOV     -6(R0),R2       ; GET ADR OF REST OF FILE
      177772
01554 011013            ERAS5:  MOV     (R0),(R3)       ; MOVE LINK
01556 001405                    BEQ     ERAS3           ; BRANCH IF END
01560 021002                    CMP     (R0),R2         ; NEXT SUBP IN REST OF FILE?
01562 101005                    BHI     ERAS4           ; YES- BRANCH
01564 011000                    MOV     (R0),R0         ; GET NEXT LINK
01566 005020                    CLR     (R0)+           ; ZERO TAG FOR "SAVE"
01570 000771                    BR      ERAS5           ; LOOP
01572 010367            ERAS3:  MOV     R3,TAGEND       ; ADJUST END OF LINK
      177640
01576 000167            ERAS4:  JMP     CKRPAR          ; CK ")" AND EXIT
      176514
                                .IFDF   $DISK
```

```
                        ,SBTTL  "LPEN" ROUTINE (NOT INTERRUPT)
                        ,ENDC
                ;       ****************************************

                        ; ROUTINE TO HANDLE
                        ;       CALL "LPEN" (H, TAG [,X, Y])
                        ; DOESN'T CHECK REST OF ARGS IF H=0

001602          LPEN:
001602 004767           JSR     PC,BUFPOL       ; ENTER POLISH MODE AND CK "("
       176376
001606 001610'                  ,+2             ; EXIT POLISH FOR NOW
001610 004767           JSR     PC,GETADR       ; GET ADR OF H INTO R2
       000222
001614 005022           CLR     (R2)+           ; CLEAR HI-ORDER WORD
001616 016712           MOV     LPEN,F,(R2)     ; STORE HIT VARIABLE
       000056
001622 004767 LPEN0:    JSR     PC,ENTERP       ; IMMED, POLISH
       176330
001626 001702'                  +CKOPCM         ; JUMP BY THE COMMA
001630 004767           JSR     PC,GETADR       ; GET ADR OF TAG INTO R2
       000202
001634 005022           CLR     (R2)+           ; CLEAR HI-ORDER WORD
001636 016712           MOV     LPENT,(R2)      ; STORE THE TAG
       000024
001642 012700           MOV     #LPENX,R0       ; PUT ADDRESS OF SOURCE
       001670'
001646 004767           JSR     PC,OPTSTR       ; STORE OPTIONAL ARGUMENT X
       004444
001652 004767           JSR     PC,OPTSTR       ; STORE OPTIONAL ARGUMENT Y
       004440
001656 005067           CLR     LPEN,F          ; CLEAR LPEN HIT FLAG
       000016
001662 000167           JMP     CKRPAR          ; CHECK ")" AND RETURN
       176430

001666 000000 LPENT:    ,WORD 0                 ; LPEN TAG STORAGE
001670 000000 LPENX:    ,WORD 0,0               ; X COORD, OF LP HIT
001672 000000
001674 000000 LPENY:    ,WORD 0,0               ; Y COORD, OF LP HIT
001676 000000
001700 000000 LPEN,F:   ,WORD 0                 ; LPEN HIT FLAG ( HIT = 1)
                        ,IFDF   $DISK
```



```
                        ,SBTTL  MISCELLANEOUS ROUTINES
                        ,ENDC
                ;       ****************************************

                        ; ROUTINE TO CHECK (POSSIBLY) OPTIONAL COMMA
                                        ;  USES R2

001702          CKOPCM:
001702 112146           MOVB    (R1)+,-(SP)     ; GET THE TOKEN IN QUESTION
001704 000241           CLC                     ; ASSUME FOUND
001706 121627           CMPB    (SP),#,COMMA    ; COMPARE WITH COMMA
       000000G
001712 001410           BEQ     CKOPC0          ; BR IF A MATCH
001714 005767           TST     OPARGF          ; NOT A MATCH, OPTIONAL?
       176154
001720 001407           BEQ     CKOSYN          ; NOT OPTIONAL, ERROR
001722 121627           CMPB    (SP),#,RPAR     ; IS IT A ")" ?
       000000G
001726 001004           BNE     CKOSYN          ; NO- ERROR
001730 005301           DEC     R1              ; POINT AT ")"
001732 000261           SEC                     ; FLAG COMMA NOT FOUND
001734 005726 CKOPC0:   TST     (SP)+           ; CLEAN STACK
001736 000134           POLRET                  ; AND EXIT
001740 000167 CKOSYN:   JMP     ERRSYN          ; SYNTAX ERROR
       000000G

                        ; ROUTINE TO SET-GRAPHIC-MODE FROM R0
                        ; CHECKS TO SEE IF SAME AS PREVIOUS MODE

001744          PUTSGM:
001744 020067           CMP     R0,OLDMOD       ; DIFFERENT MODE?
       000014
001750 001404           BEQ     PUTS0           ; NO- BRANCH
001752 004767           JSR     PC,PUTWD        ; YES- INSERT IT
       176672
001756 010067           MOV     R0,OLDMOD       ; SET "NEW" OLDMOD
       000002
001762 000207 PUTS0:    RETURN                  ; EXIT

001764 000000 OLDMOD:   ,WORD 0                 ; VALUE OF PREVIOUS OLD SET-G-M
                        ,IFDF   $DISK
```

```
1                       .SBTTL  ARGUMENT GET FOR APNT,RDOT AND VECT
2                       .ENDC
3                ;      ************************************
4
5                       ; ROUTINE TO SUPPLY ALL ARGUMENTS FOR "VECT",
6                       ; "APNT" AND "RDOT"
7                       ; ON EXIT:
8                       ;       R0: BITS 10:0 OF SET-GRAPHIC-MODE
9                       ;       (SP): VALUE OF Y
10                      ;       2(SP): VALUE OF X
11                      ;       XYBIG: NO. OF ARGS. (X,Y) EXCEEDING 63
12                      ;       XSIGN: BIT 13 ON IF X NEGATIVE
13                      ;       YSIGN: BIT 6 ON IF Y NEGATIVE
14                      ;  CALLED VIA:  JSR  PC,GETARG
15
16 01766        ARGGET:
17 01766 012667         MOV     (SP)+,GETSAV            ; SAVE RETURN ADR OFF STK
         000034
18 01772 005067         CLR     XYBIG                   ; ASSUME X,Y < 64
         000032
19 01776 004767         JSR     PC,POLENT               ; ENTER POLISH AND CK "("
         176266
20 02002 000136'                +GETONE                 ; GET X OR DX
21 02004 004770'                +SCALEX                 ; SCALE IT
22 02006 001440'                +TST64                  ; CHECK IF < 64 AND ONTO STK
23 02010 000076'                +GETNUM                 ; CK "," AND GET Y
24 02012 005042'                +SCALEY                 ; SCALE IT
25 02014 001440'                +TST64                  ; TST IF < 64 AND ONTO STK
26 02016 003058'                +LIFT                   ; GET L, I, F, T
27 02020 002022'                .+2             ; EXIT FROM POLISH
28 02022 000177         JMP     @GETSAV                 ; RETURN TO CALLER
         000000
29
30 02026 000000 GETSAV: .WORD 0                 ; RETURN ADDRESS
31 02030 000000 XYBIG:  .WORD 0                 ; VALUES > 63
32 02032 000000 XSIGN:  .WORD 0                 ; BIT 13 ON IF X NEG
33 02034 000000 YSIGN:  .WORD 0                 ; BIT 6 ON IF Y NEG
34                      .IFDF   $DISK
```



```
1                       .SBTTL  ADDRESS CALCULATION ROUTINE
2                       .ENDC
3                ;      ************************************
4
5
6                       ; ROUTINE TO FETCH ADDRESS FOR STORING VARIABLES
7                       ; IN ARRAYS, IF SS2<=1 (I.E. XGRA,YGRA, OR FIGR )
8                       ; THEN ONLY ONE WORD ENTRIES ARE ASSUMED.
9                       ;  USES R1, R2, R3,  SAVES R0
10                      ;  CRASHES IF CALLED WHEN R1 POINTS TO CONSTANT
11                      ; DESTROYS THE FAC IF SUBSCRIPTS INVOLVED
12
13 02036        GETADR:
14 02036 010046         MOV     R0,-(SP)        ; SAVE R0
15 02040 112102         MOVB    (R1)+,R2        ; BUILD WORD OFFSET
16 02042 100535         BMI     GETAD3          ; CK IF OPTIONAL ARGUMENT
17 02044 000302         SWAB    R2
18 02046 152102         BISB    (R1)+,R2        ; GET SECOND HALF
19 02050 061502         ADD     (R5),R2         ; ADD PTR TO USER AREA
20 02052 021227         CMP     (R2),#-2        ; IS IT A SCALAR OR ARRAY?
         177776
21 02056 003070         BGT     ADRARG          ; ARGUMENT ERROR IF STRING
22 02060 010246         MOV     R2,-(SP)        ; SAVE R2
23 02062 004767         JSR     PC,GETVAR       ; GET ADR AND SUBSCRIPTS
         000000G
24 02066 012602         MOV     (SP)+,R2        ; RESTORE R2
25 02070 022227         CMP     (R2)+,#-3       ; WAS IT A SCALAR?
         177775
26 02074 001457         BEQ     GETAD0          ; YES- BRANCH
27 02076 026227         CMP     4(R2),#-2       ; IS SS2 FLAGGED FOR XGRA ETC.?
         000004
         177776
28 02104 003461         BLE     GETAD1          ; YES- BRANCH
29 02106 005742         TST     -(R2)           ; FIX UP R2
30 02110 016500         MOV     SS1SAV(R5),R0   ; SET UP SS1
         000024
31 02114 016503         MOV     SS2SAV(R5),R3   ; SET UP SS2
         000026
32 02120 020062         CMP     R0,4(R2)        ; SS1 > SS1MAX?
         000004
33 02124 003040         BGT     ERSS3           ; YES- ERROR
34 02126 005703         TST     R3              ; 2 DIMENSIONAL?
35 02130 100427         BMI     LOCNO2          ; NO- BRANCH
36 02132 005762         TST     6(R2)           ; YES- IS IT DIMENSIONED OKAY?
         000006
37 02136 100433         BMI     ERSS3           ; NO- ERROR
38 02140 020362         CMP     R3,6(R2)        ; SS2 > SS2MAX?
         000006
39 02144 101030         BHI     ERSS3           ; YES- ERROR
40 02146 016246         MOV     4(R2),-(SP)     ; PUT SS2MAX ON STK
         000004
41 02152 005216         INC     (SP)
42 02154 010346         MOV     R3,-(SP)
43 02156 012746         MOV     #20,-(SP)
         000020
44 02162 006303 LCLOOP: ASL     R3
45 02164 006366         ASL     2(SP)
```

```
                000002
46 02170 103002         BCC     .+6             ; MULTIPLY SS2 BY SS1MAX
47 02172 066603         ADD     4(SP),R3
                000004
48 02176 005316         DEC     (SP)            ; AND ADD SS1
49 02200 003370         BGT     LCLOOP
50 02202 062706         ADD     #6,SP           ; CLEAN STK
                000006
51 02206 060300         ADD     R3,R0
52 02210 005200 LOCNO2: INC     R0
53 02212 006300         ASL     R0              ; 2 BYTES/WORD
54 02214 006300         ASL     R0              ; 2 WORDS/ENTRY
55 02216 016202         MOV     2(R2),R2
                000002
56 02222 060002         ADD     R0,R2
57 02224 000403         BR      GETAD0          ; AND GO TO EXIT
58 02226            ERSS3:
59 02226 104400         TRAP    0
60                      .IFNDF  $LONGER
61 02230     123        .ASCII  /SOB/
   02231     117
   02232     102
62                      .ENDC
63                      .IFDF   $LONGER
64                      .ASCII  /SUBSCRIPT OUT OF BOUNDS/
65                      .ENDC
66 02233     000        .BYTE   0
67                      .EVEN
68 02234 012600 GETAD0: MOV     (SP)+,R0        ; RESTORE R0
69 02236 000207         RETURN                  ; EXIT
70 02240 000167 ADRARG: JMP     ERRARG          ; ARGUMENT ERROR
                000000G
71 02244 000167 ADRSYN: JMP     ERRSYN          ; SYNTAX ERROR
                000000G
72 02250 012203 GETAD1: MOV     (R2)+,R3        ; PUT BASE ADR INTO R3
73 02252 022323         CMP     (R3)+,(R3)+     ; POINT R3 AT A(0)
74 02254 005712         TST     (R2)            ; SS1MAX=0?
75 02256 001014         BNE     GETAD6          ; NO- BRANCH AND USE IT
76 02260 010302         MOV     R3,R2           ; POINT AT ARRAY
77 02262 022227         CMP     (R2)+,#DJMP     ; A DJMP AT END?
                160000
78 02266 001375         BNE     .-4             ; NO- LOOP 'TIL FOUND
79 02270 011202         MOV     (R2),R2         ; POINT AT ADR IN DPY FILE
80 02272 005742         TST     -(R2)           ; POINT AT SS1 IN DPY FILE
81                      .IFDF   $LPS
82 02274 002005         BGE     GETAD7
83 02276 011267         MOV     (R2),SCLSAV
                004012
84 02302 012702         MOV     #SCLSAV,R2
                006314'
85 02306 005412         NEG     (R2)
86 02310            GETAD7: .ENDC
87 02310 026512 GETAD6: CMP     SS1SAV(R5),(R2) ; SS1 > SS1MAX?
                000024
88 02314 003344         BGT     ERSS3           ; YES- ERROR
89 02316 016502         MOV     SS1SAV(R5),R2   ; GET SS1
                000024
```

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```
90 02322 100403         BMI     GETAD2          ; BR IF NO SUBSCRIPTS
91 02324 006302         ASL     R2              ; ADDOUNT FOR WORDS NOT BYTES
92 02326 060302         ADD     R3,R2           ; GET ADDRESS
93 02330 000741         BR      GETAD0          ; EXIT
94 02332 010302 GETAD2: MOV     R3,R2           ; IF NO SUBSCRIPTS GET JUST A
95 02334 000737         BR      GETAD0          ; EXIT
96 02336 005767 GETAD3: TST     OPARGF          ; SEE IF ARG IS OPTIONAL
                175532
97 02342 001740         BEQ     ADRSYN          ; NO- SYNTAX ERROR
98 02344 120227 GETAD5: CMPB    R2,#,RPAR       ; IS IT A ")" ?
                000000G
99 02350 001335         BNE     ADRSYN          ; NO- ERROR
100 2352 005301         DEC     R1              ; YES- POINT AT IT
101 2354 005002         CLR     R2              ; MAKE ADR = 0
102 2356 000726         BR      GETAD0          ; EXIT
103                     .IFDF   $DISK
```

```
1                       ,SBTTL  "DSTP", "CONT", AND "INIT" ROUTINES
2                       ,ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE "DSTP", "CONT", AND "INIT"
6
7  002360               DSTP:
8  002360 012746                MOV     #CKEOL,-(SP)    ; NORMAL PROGRAM EXIT
          000324'
9  002364               STOPA:
10 02364 010667                 MOV     SP,STOP.F       ; SET STOP FLAG
          000054
11 02370 005737                 TST     @#GTVECT        ; VECTORS BEEN SET?
          000000G
12 02374 001420                 BEQ     STOPB           ; NO- EXIT NOW
13 02376 005767                 TST     DPC             ; DPC CLEARED?
          000000G
14 02402 001415                 BEQ     STOPB           ; YES
15 02404 005767                 TST     RUN.F           ; CURRENTLY RUNNING?
          000036
16 02410 001414                 BEQ     STOPB+4         ; NO
17 02412 012767                 MOV     #SDINT,DSTOP+2  ; LOAD STOP
          173400
          006166
18 02420 005767 STOPC:          TST     DSR             ; STOPPED YET?
          000000G
19 02424 002375                 BGE     .-4             ; NO- LOOP SOME MORE
20 02426 022767                 CMP     #DJMP,DSTOP+2   ; BACK TO REGULAR?
          160000
          006152
21 02434 001371                 BNE     STOPC           ; NO- WAIT SOME MORE
22 02436 005067 STOPB:          CLR     RUN.F           ; SIGNAL STOPPED
          000004
23 02442 000207                 RETURN
24
25 02444 000000 STOP.F: .WORD 0                         ; STOP FLAG (=1 FOR STOP)
26 02446 000000 RUN.F:  .WORD   0                       ; FLAG TO INDICATE RUNNING
27
28 02450               CONT:
29 02450 012746                 MOV     #CKEOL,-(SP)    ; EXIT FOR CALLER
          000324'
30 02454               CONTA:
31 02454 005767                 TST     STOP.F          ; WERE WE STOPPED?
          177764
32 02460 001403                 BEQ     CONT0           ; NO- THEN DON'T START IT
33 02462 005067                 CLR     STOP.F          ; CLEAR STOP FLAG
          177756
34 02466 000500                 BR      INIT3           ; CLEAN SUBP STK AND START UP
35 02470 000207 CONT0:          RETURN
36
37 02472 004767 RESTR:  JSR     PC,INIT3        ; FIX STACK AND START DPU
          000172
38 02476 000002                 RTI
39
40 02500               INIT:
41 02500 012746                 MOV     #CKEOL,-(SP)    ; NORMAL ENTRY
          000324'
```



```
42 02504               INITA:                          ; ENTRY FROM BUFTST
43 02504 004767                 JSR     PC,STOPA        ; MAKE SURE DISPLAY HAS STOPPED
          177654
44              ; ***  SET UP INTERRUPT VECTORS HERE
45 02510 012700                 MOV     #GTVECT,R0      ; SET UP DESTINATION
          000000G
46 02514 062700                 ADD     #12,R0          ; OFFSET TO TOP
          000012
47 02520 012702                 MOV     #PR4,R2         ; AND PRIORITY
          000200
48 02524 010210                 MOV     R2,(R0)         ;  PR4 FOR RESTR
49 02526 012740                 MOV     #RESTR,-(R0)    ; RESTART
          002472'
50 02532 010240                 MOV     R2,-(R0)        ;  PR4 FOR LP INTERRUPT
51 02534 012740                 MOV     #LPNINT,-(R0)   ; LP INTERRUPT
          003240'
52 02540 010240                 MOV     R2,-(R0)        ;  PR4 FOR STOP DISPLAY
53 02542 012740                 MOV     #DISINT,-(R0)   ; STOP DISPLAY INTERRUPT
          000466'
54 02546 005067                 CLR     OLDMOD          ; MAKE SURE MODE CHANGES
          177212
55 02552 005067                 CLR     INSRTF          ; CLEAR INSERT PENDING FLAG
          176056
56 02556 005067                 CLR     SCAL.F          ; CLEAR SCALE FLAG
          000130
57 02562 005067                 CLR     LPEN.F          ; CLEAR LP HIT FLAG
          177112
58 02566 005067                 CLR     STOP.F          ; CLEAR THE STOP FLAG
          177652
59              ; *** MAKE SURE TRAK IS OFF
60 02572 012767                 MOV     #DJMP,BEG       ; MAKE SURE TRAK IS OFF
          160000
          005706
61              ; *** MAKE SURE END OF DPY FILE IS AFTER PERMANENT STUFF
62 02600 005767                 TST     DCRASH          ; "FIX" BEEN CALLED?
          006006
63 02604 001004                 BNE     INIT1           ; BR IF "FIX" ALREADY CALLED
64 02606               INIT2:
65 02606 010446                 MOV     R4,-(SP)
66                              .IFDF   $DISK
67                              JSR     PC,CLOSALL      ; CLOSE ALL FILE I/O
68                              .ENDC
69 02610 004767                 JSR     PC,FIX0         ; GET SPACE
          000000G
70 02614 012604                 MOV     (SP)+,R4
71 02616 016700 INIT1:  MOV     ACTST,R0
          176020
72 02622 010067                 MOV     R0,DSTOP        ; SET LO=END FOR DJMP
          005762
73 02626 010067                 MOV     R0,DISEND       ; IT IS A NEW DISEND
          176004
74 02632 012720                 MOV     #DJMP,(R0)+     ; PUT A DJMP THERE
          160000
75 02636 012710                 MOV     #BEG,(R0)       ; FOLLOWED BY LOOP ADR
          010506'
76 02642 010067                 MOV     R0,ACTEND       ; ACTEND POINTS TO WORD AFTER DISEND
          175772
```

```
77                      ; ***  FIX UP TAG POINTER
78 02646 016700                 MOV     TAGHED,R0       ; GET FIRST TAG ADDRESS
         176562
79 02652 005720                 TST     (R0)+           ; BUMP IT BY 2
80 02654 010067                 MOV     R0,TAGEND       ; MAKE THAT TAGEND
         176556
81 02660 005010                 CLR     (R0)            ; AND CLEAR LAST POINTER
82                      ; ***  PATCH UP ADSTK AND NSTSK HERE
83 02662 012767                 MOV     #NSBAS,NSTSK    ; ADJUST BUILDING STACK
         001364'
         176522
84 02670 012767 INIT3:  MOV     #ADBAS,ADSTK    ; ADJUST RUNNING STACK
         001334'
         176464
85 02676 010667                 MOV     SP,RUN,F        ; SIGNAL RUNNING
         177544
86 02702 012767                 MOV     #BEG,DPC        ; START UP DPU
         010506'
         000000G
87 02710 000207                 RETURN                  ; RETURN TO USER
88
89 02712 000000 SCAL.F: .WORD 0                 ; SCALE HAS BEEN DONE FLAG
90
91                      ;       ROUTINE TO HANDLE LINKING FOR SAVE AND RESTORE
92                              .IFDF   $DISK
93                      SAVERT:
94                              JSR     PC,EVAL         ; GET STRING (BASICX)
95                              BCS     .+6             ; FOUND A STRING?
96                              JMP     ERRSYN          ; NO- ERROR
97                              CMP     (SP),#-1        ; A NULL STRING?
98                              BEQ     .-10            ; YES- ERROR
99                              CMPB    (R1)+,#,RPAR    ; FOLLOWED BY ")" ?
100                             BNE     .-16            ; NO- ERROR
101                             JMP     SAV24           ; RETURN TO OVERLAY
102
103                             .ENDC
104                             .IFDF   $DISK
```



```
1                               .SBTTL  "NOSC","ON", "OFF" ROUTINES
2                               .ENDC
3                       ;       ****************************************
4                               ; TURN OFF SCALE
5
6 002714                NOSC:
7 002714 005067                 CLR     SCAL.F          ; NO MORE SCALE
         177772
8 002720 000167                 JMP     CKEOL           ; AND EXIT
         175400
9
10                      ;       ****************************************
11                              ; ROUTINE TO TURN SUBP ON AND OFF
12
13 02724                ON:
14 02724 012746                 MOV     #SDINT,-(SP)    ; A SDINT
         173400
15 02730 004767 ON1:    JSR     PC,POLENT       ; ENTER POLISH MODE, CK "("
         175334
16 02734 000136'                +GETONE         ; GET SUBP TAG
17 02736 000006'                +INTEGR         ; INTEGERIZE
18 02740 002742'                .+2             ; EXIT POLISH MODE
19 02742 016502                 MOV     FAC2(R5),R2     ; GET TAG
         000042
20 02746 003002                 BGT     .+6             ; LEGITIMATE- BRANCH
21 02750 000167 ON0:    JMP     ERRARG          ; NO- ERROR
         000000G
22 02754 004767                 JSR     PC,TAGSRH       ; FIND TAG
         176434
23 02760 005700                 TST     R0              ; DID WE SUCCEED?
24 02762 001772                 BEQ     ON0             ; NO- BRANCH
25 02764 162700                 SUB     #10,R0          ; POINT AT SDINT/DJMP
         000010
26 02770 005767                 TST     INSRTF          ; AN INSERT PENDING?
         175640
27 02774 001375                 BNE     .-4             ; YES- LOOP TIL FREE
28 02776 016703                 MOV     ACTEND,R3       ; GET END OF DPY FILE
         175636
29 03002 005743                 TST     -(R3)           ; POINT TO PREVIOUS WORD
30 03004 020003                 CMP     R0,R3           ; WHERE DOES R0 POINT?
31 03006 001403                 BEQ     ON2             ; TO WD1
32 03010 012610                 MOV     (SP)+,@R0       ; STORE WORD
33 03012 000167 ON3:    JMP     CKRPAR          ; AND RETURN TO USER
         175300
34 03016 012667 ON2:    MOV     (SP)+,WD1       ; STORE WORD
         175716
35 03022 000773                 BR      ON3             ; AND EXIT
36
37 03024                OFF:
38 03024 012746                 MOV     #DJMP+1,-(SP)   ; A DJMP+1
         160001
39 03030 000737                 BR      ON1             ; AND CONTINUE
40                              .IFDF   $DISK
```

```
1                       ,SBTTL  "FIX" ROUTINE CALLER
2                               ,ENDC
3               ;       ************************************
4
5                       ; ROUTINE TO HANDLE:
6                       ;       CALL "FIX"(N)
7
8 003032        FIX:
9 003032 004767         JSR     PC,POLENT       ; ENTER POLISH MODE, CK "("
         175232
10 03036 000136'                +GETONE         ; GET N
11 03040 000006'                +INTEGR         ; INTEGERIZE IT
12 03042 003044'                ,+2             ; EXIT POLISH MODE
13                      ,IFDF   $DISK
14                      JSR     PC,CLOSALL      ; CLOSE ALL FILE I/O
15                      ,ENDC
16 03044 000167         JMP     FIXSP           ; JUMP TO OVERLAY
         000000G
17
18                      ,IFDF   $DISK
19              FREE:
20                      JSR     PC,CLOSALL      ; CLOSE ALL FILE I/O
21                      JMP     FREE0           ; GO TO OVERLAY
```



```
1                       ,SBTTL  ROUTINE TO FETCH L, I, F, T
2                       ,ENDC
3               ;       ************************************
4
5                       ; ROUTINE TO HANDLE L, I, F, T
6                       ; UPON ENTRY R1 POINTS TO COMMA PRECEDING L
7                       ; UPON EXIT R0 CONTAINS BITS 0:10 OF SGM WORD
8
9                       ; L = LP INTERRUPT ENABLE
10                      ; I = INTENSITY OF LINE
11                      ; F = FLASH (BLINK)
12                      ; T = TYPE OF LINE (SOLID, ETC.)
13
14 03050        LIFT:
15 03050 012767         MOV     #40000,INVIS    ; ASSUME VISIBLE
         040000
         000160
16 03056 010446         MOV     R4,-(SP)        ; SAVE R4 FOR RETURN
17 03060 004767         JSR     PC,QIKPOL       ; ENTER POLISH MODE
         175226
18 03064 000066'                +SETOPT         ; SET OPTIONAL MODE
19 03066 000026'                +PLOOP          ; POLISH LOOP
20 03070 000004                 +4              ; 4 TIMES
21 03072 000076'                +GETNUM         ; GET ",L,I,F,T"
22 03074 000006'                +INTEGR         ; INTEGERIZE EACH IN TURN
23 03076 000000'                +SAVINT         ; SAVE ON THE STACK
24 03100 000040'                +ELOOP          ; END OF POLISH LOOP
25 03102 003104'                ,+2             ; EXIT FROM POLISH MODE
26 03104 005000         CLR     R0              ; CLEAR DESTINATION WORD
27 03106 012602         MOV     (SP)+,R2        ; GET TYPE OF LINE
28 03110 003406         BLE     LIFT0           ; BRANCH IF NO CHANGE
29 03112 020227         CMP     R2,#4           ; COMPARE R2 TO 4
         000004
30 03116 003003         BGT     LIFT0           ; IGNORE IF T>4
31 03120 062702         ADD     #3,R2           ; ADD TO GET SET-BIT
         000003
32 03124 050200         BIS     R2,R0           ; SET T INTO R0
33 03126 012602 LIFT0:  MOV     (SP)+,R2        ; GET F
34 03130 004767         JSR     PC,BITGET       ; F=0: 0
         000060
35 03134 050300         BIS     R3,R0           ; F>0: 30, F<0: 20
36 03136 012602         MOV     (SP)+,R2        ; GET I
37 03140 001415         BEQ     LIFT1           ; BRANCH IF NO CHANGE
38 03142 100003         BPL     LIFT2           ; BRANCH IF VISIBLE
39 03144 005067         CLR     INVIS           ; MAKE INVISIBLE
         000066
40 03150 005402         NEG     R2              ; MAKE R2 POSITIVE
41 03152 005302 LIFT2:  DEC     R2
42 03154 020227         CMP     R2,#10          ; COMPARE R2 WITH 8
         000010
43 03160 002005         BGE     LIFT1           ; IGNORE IF TOO BIG
44 03162 052702         BIS     #10,R2          ; ADD IN 8
         000010
45 03166 000302         SWAB    R2
46 03170 006202         ASR     R2              ; PUT BITS IN CORRECT POSITION
47 03172 050200         BIS     R2,R0           ; I IS SET INTO R0
48 03174 012602 LIFT1:  MOV     (SP)+,R2        ; GET L
```

```
49 03176 004767          JSR     PC,BITGET       ; L=0: 0
         000012
50 03202 006303          ASL     R3              ; L>0: 140
51 03204 006303          ASL     R3              ; L<0: 100
52 03206 050300          BIS     R3,R0           ; L IS SET IN R0
53 03210 012604          MOV     (SP)+,R4        ; RESORE R4
54 03212 000134          POLRET                  ; AND EXIT
55
56 03214         BITGET:
57 03214 005003          CLR     R3              ; CLEAR DESTINATION
58 03216 005702          TST     R2              ; CHECK SIGN OF R2
59 03220 001405          BEQ     BITZER          ; BRANCH IF R2 = 0
60 03222 002402          BLT     BITNEG          ; BRANCH IF R2 < 0
61 03224 052703          BIS     #10,R3          ; POS: 30
         000010
62 03230 052703 BITNEG:  BIS     #20,R3          ; NEG: 20
         000020
63 03234 000207 BITZER:  RETURN                  ; ZERO: 0
64
65 03236 000000 INVIS:   .WORD 0                 ; VISIBILITY FLAG (BIT 14)
66                       .IFDF   $DISK
```



```
1                        .SBTTL  LP INTERRUPT HANDLER
2                        .ENDC
3                ;       ****************************************
4
5                        ; ROUTINE TO HANDLE LIGHT PEN INTERRUPT
6
7 003240         LPNINT:
8 003240 010046          MOV     R0,-(SP)
9 003242 010246          MOV     R2,-(SP)        ; SAVE REGISTERS
10 03244 010546          MOV     R5,-(SP)        ; SAVE R5
11 03246 016705          MOV     USRAREA,R5      ; SET UP R5 TO USER AREA
         000000G
12 03252 016746          MOV     $ERVEC,-(SP)    ; SAVE ERROR VECTOR IN FPMP
         000000G
13 03256 017700          MOV     @ADSTK,R0       ; GET PTR TO TAG (IF ANY)
         176100
14 03262 001403          BEQ     LPINT0          ; NO TAG- BRANCH
15 03264 005720          TST     (R0)+           ; POINT R0 AT TAG
16 03266 011000          MOV     (R0),R0         ; PUT TAG INTO R0
17 03270 002407          BLT     LPINT1          ; HIT MUST BE IN TRAK
18 03272 005767 LPINT0:  TST     LPEN,F          ; ANOTHER HIT PENDING?
         176402
19 03276 001150          BNE     LPEX1           ; YES- EXIT
20 03300 005367          DEC     LPEN,F          ; NO- MAKE FLAG = -1
         176374
21 03304 010067          MOV     R0,LPENT        ; STORE TAG
         176356
22 03310 016546 LPINT1:  MOV     FAC2(R5),-(SP)  ; SAVE FAC
         000042
23 03314 016546          MOV     FAC1(R5),-(SP)
         000040
24 03320 016746          MOV     ABS,F,-(SP)     ; AND FLAG TOO
         000314
25 03324 005065          CLR     FAC1(R5)
         000040
26 03330 016700          MOV     DISX,R0         ; GET X POSITION
         000000G
27 03334 042700          BIC     #176000,R0      ; ONLY FIRST 10 BITS
         176000
28 03340 010065          MOV     R0,FAC2(R5)     ; PUT IN FAC
         000042
29 03344 005767          TST     LPEN,F          ; IN TRAK?
         176330
30 03350 002420          BLT     LPINT2          ; NO- BRANCH
31 03352 166700          SUB     XT,R0
         005146
32 03356 006200          ASR     R0              ; DIV BY 2
33 03360 006200          ASR     R0              ; DIV BY 2
34 03362 060067          ADD     R0,XT           ; OLD + (NEW-OLD)/4
         005136
35 03366 016765          MOV     XT,FAC2(R5)     ; PUT IN SMOOTHED VALUE
         005132
         000042
36 03374 032767          BIT     #40,DSR         ; ON THE EDGE?
         000040
         000000G
37 03402 001403          BEQ     LPINT2          ; NO
```

```
38 03404 012767          MOV     #1000,XT        ; STORE CENTER IN XT
         001000
         005112
39 03412 010667 LPINT2:  MOV     SP,ABS.F        ; SCALE ABSOLUTE
         000222
40 03416 012700          MOV     #USCL.X,R0      ; UNSCALE MODE
         006362'
41 03422 004767          JSR     PC,SC.USC       ; DO IT NOW
         000672
42 03426 016546          MOV     FAC2(R5),-(SP)
         000042
43 03432 016546          MOV     FAC1(R5),-(SP)  ; SAVE UNSCALED X ON STACK
         000040
44 03436 005065          CLR     FAC1(R5)
         000040
45 03442 016700          MOV     DISY,R0         ; GET Y POSITION
         000006G
46 03446 042700          BIC     #176000,R0      ; ONLY FIRST 10 BITS
         176000
47 03452 010065          MOV     R0,FAC2(R5)     ; PUT INTO FAC
         000042
48 03456 005767          TST     LPEN.F          ; IN TRAK?
         176216
49 03462 002420          BLT     LPINT3          ; NO- BRANCH
50 03464 166700          SUB     YT,R0
         005036
51 03470 006200          ASR     R0              ; DIV BY 2
52 03472 006200          ASR     R0              ; DIV BY 2
53 03474 060067          ADD     R0,YT           ; OLD + (NEW-OLD)/4
         005026
54 03500 016765          MOV     YT,FAC2(R5)     ; PUT IN SMOOTHED VALUE
         005022
         000042
55 03506 032767          BIT     #40,DSR         ; ON THE EDGE?
         000040
         000000G
56 03514 001403          BEQ     LPINT3          ; NO
57 03516 012767          MOV     #600,YT         ; STORE CENTER IN YT
         000600
         005002
58 03524 012700 LPINT3:  MOV     #USCL.Y,R0      ; UNSCALE Y MODE
         006352'
59 03530 004767          JSR     PC,SC.USC       ; DO IT NOW
         000564
60 03534 005767          TST     LPEN.F          ; IN TRAK?
         176140
61 03540 002405          BLT     LPINT4          ; NO- BRANCH
62 03542 016700          MOV     TRAKX,R0        ; FROM STK
         001216
63 03546 016702          MOV     TRAKY,R2        ; FROM FAC
         001214
64 03552 000406          BR      LPINT5          ; STORE IT
65 03554 005467 LPINT4:  NEG     LPEN.F          ; MAKE FLAG = 1
         176120
66 03560 012700          MOV     #LPENX,R0       ; FROM STK
         001670'
67 03564 012702          MOV     #LPENY,R2       ; FROM FAC
```



```
         001674'
68 03570 012620 LPINT5:  MOV     (SP)+,(R0)+
69 03572 012610          MOV     (SP)+,(R0)      ; STORE X
70 03574 016522          MOV     FAC1(R5),(R2)+
         000040
71 03600 016512          MOV     FAC2(R5),(R2)   ; STORE Y
         000042
72 03604 012667          MOV     (SP)+,ABS.F     ; RESTORE FLAG
         000030
73 03610 012665          MOV     (SP)+,FAC1(R5)
         000040
74 03614 012665          MOV     (SP)+,FAC2(R5)  ; RESTORE FAC
         000042
75 03620 012667 LPEX1:   MOV     (SP)+,$ERVEC    ; RESTORE $ERVEC
         000000G
76 03624 012605          MOV     (SP)+,R5        ; RESTORE R5
77 03626 012602          MOV     (SP)+,R2
78 03630 012600          MOV     (SP)+,R0        ; RESTORE REGISTERS
79 03632 005267          INC     DPC             ; RESTART DPU
         000000G
80 03636 000002          RTI                     ; AND EXIT
81
82 03640 000000 ABS.F:   .WORD 0                 ; ABSOLUTE SCALE FLAG
83                       .IFDF  $DISK
84                       .EOT
```

```
2                       ;
3                       ;       DEC - 11 - LBPGB - A - LA    BASIC KERNEL V02-01
4                       ;
5                       ;       GTB,MAC TAPE 3 OF 4
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23                      ;
24                      ;       AUTHOR: DR. STEPHEN R. ALPERT   AUGUST 1973
25                              .SBTTL  "STAT" ROUTINE
26                              .ENDC
27                      ;       ****************************************
28
29                              ; ROUTINE TO HANDLE
30                              ;       CALL "STAT"( FONT [, INT] )
31
32                              ; FONT >0: NORMAL, =0: NO CHANGE, <0: ITALICS
33                              ; INT >0: LP INTENSIFIED, =0: NO CHANGE, <0: HIT NOT INTEN.
34
35 03642               STAT:
36 03642 004767                 JSR     PC,BUFPOL       ; ENTER POLISH MODE AND CK ")"
         174336
37 03646 000136'                +GETONE                 ; GET FONT
38 03650 000006'                +INTEGR                 ; MAKE SURE AN INTEGER
39 03652 000000'                +SAVINT                 ; SAVE ON STACK
40 03654 000066'                +SETOPT                 ; INT IS OPTIONAL
41 03656 000076'                +GETNUM                 ; CK "," AND GET INT
42 03660 000006'                +INTEGR                 ; MAKE SURE AN INTEGER
43 03662 003664'                .+2                     ; EXIT FROM POLISH
44 03664 016502                 MOV     FAC2(R5),R2     ; GET INT
         000042
45 03670 005402                 NEG     R2              ; NEGATE SO BITGET RETURNS VALUES
46 03672 004767                 JSR     PC,BITGET       ; POS: 20,NEG: 30, ZERO: 0
         177316
47 03676 006303                 ASL     R3
48 03700 006303                 ASL     R3
49 03702 006303                 ASL     R3              ; POS: 200, NEG: 300, ZERO: 0
50 03704 010300                 MOV     R3,R0           ; SAVE IN R0
51 03706 012602                 MOV     (SP)+,R2        ; GET FONT
52 03710 005402                 NEG     R2              ; NEGATE SO BITGET RETURNS VALUES
53 03712 004767                 JSR     PC,BITGET
         177276
54 03716 006303                 ASL     R3              ; POS: 40,NEG: 60, ZERO: 0
```



```
55 03720 050300                 BIS     R3,R0           ; SET FONT INTO R0
56 03722 052700                 BIS     #170000,R0      ; SET UP LOAD STAT, REG, A
         170000
57 03726 000167                 JMP     $DXIT           ; INSERT TO DPY/ CK ")"/ RETURN
         000246
58                              .IFDF   $DISK
```

```
1                       .SBTTL  "RDOT" ROUTINE
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE
6                       ;       CALL "RDOT"( DX, DY [,L,I,F,T])
7
8 003732        RDOT:
9 003732 004767         JSR     PC,BUFTST       ; ANY BUFFER?
         174252
10 03736 005067         CLR     ABS,F           ; RELATIVE SCALE
         177676
11 03742 004767         JSR     PC,ARGGET       ; GET ARGUMENTS
         176020
12 03746 005767         TST     XYBIG           ; RDOT OR VECT?
         176056
13 03752 001424         BEQ     RDOT1           ; RDOT- BRANCH
14 03754 052700         BIS     #110000,R0      ; LONG VECTOR
         110000
15 03760 004767         JSR     PC,PUTSGM       ; SET-GRAPHIC-MODE
         175760
16 03764 016600         MOV     2(SP),R0        ; GET X
         000002
17 03770 056700         BIS     XSIGN,R0        ; SET SIGN (INVISIBLE)
         176036
18 03774 004767         JSR     PC,PUTWD        ; INSERT IT
         174650
19 04000 016700         MOV     YSIGN,R0        ; GET SIGN OF Y
         176030
20 04004 000300         SWAB    R0
21 04006 006200         ASR     R0              ; PUT IN BIT 13
22 04010 062600         ADD     (SP)+,R0        ; ADD IN Y
23 04012 004767         JSR     PC,PUTWD        ; INSERT IT
         174632
24 04016 005016         CLR     (SP)            ; MAKE X = 0
25 04020 005046         CLR     -(SP)           ; MAKE Y = 0
26 04022 005000         CLR     R0              ; CLEAN BITS 10 - 0
27 04024 052700 RDOT1:  BIS     #130000,R0      ; RDOT MODE
         130000
28 04030 004767         JSR     PC,PUTSGM       ; SET-GRAPHIC-MODE
         175710
29 04034 005716         TST     (SP)            ; Y = 0?
30 04036 001013         BNE     RDOT0           ; NO- BRANCH
31 04040 005766         TST     2(SP)           ; YES- X = 0?
         000002
32 04044 001010         BNE     RDOT0           ; NO- BRANCH
33 04046 005067         CLR     YSIGN           ; MAKE Y POSITIVE
         175762
34 04052 012716         MOV     #1,(SP)         ; MAKE Y = +1
         000001
35 04056 012700         MOV     #101,R0         ; MAKE (0,-1) RDOT
         000101
36 04062 004767         JSR     PC,PUTWD        ; INSERT IT
         174562
37 04066 016600 RDOT0:  MOV     2(SP),R0        ; GET X
         000002
38 04072 000300         SWAB    R0              ; SHIFT TO LEFT
```



```
39 04074 006200         ASR     R0              ;   MOVE TO BITS 7-12
40 04076 056700         BIS     INVIS,R0        ; SET VISIBILITY
         177134
41 04102 056700         BIS     XSIGN,R0        ; SET SIGN OF X
         175724
42 04106 062600         ADD     (SP)+,R0        ; ADD IN Y
43 04110 005726         TST     (SP)+           ; CLEAN STACK
44 04112 056700         BIS     YSIGN,R0        ; SET SIGN OF Y
         175716
45 04116 000430         BR      $DXIT           ; TAKE "STANDARD" EXIT
46                      .IFDF   $DISK
```

```
1                       .SBTTL  "APNT" ROUTINE
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE
6                       ;       CALL "APNT" ( X, Y [,L,I,F,T] )
7
8 004120        APNT:
9 004120 004767         JSR     PC,BUFTST       ; ANY BUFFER?
         174064
10 004124 010667        MOV     SP,ABS,F        ; FLAG ABSOLUTE MODE
         177510
11 004130 004767        JSR     PC,ARGGET       ; GET ARGUMENTS
         175632
12 004134 052700        BIS     #114000,R0      ; SET UP MODE WORD
         114000
13 004140 004767        JSR     PC,PUTSGM       ; SET-GRAPHIC-MODE
         175600
14 004144 016600        MOV     2(SP),R0        ; PUT X IN R0
         000002
15 004150 004767        JSR     PC,ENTERP       ; IMMED POLISH
         174002
16 004154 004514'               +POSX           ; MAKE X >=0
17 004156 056700        BIS     INVIS,R0        ; SET VISIBILITY
         177054
18 004162 004767        JSR     PC,PUTWD        ; INSERT X
         174462
19 004166 012600        MOV     (SP)+,R0        ; PUT Y INTO R0
20 004170 005726        TST     (SP)+           ; CLEAN STACK
21 004172 004767        JSR     PC,ENTERP       ; IMMED POLISH
         173760
22 004176 004522'               +POSY           ; MAKE Y >=0
23 004200 004767 $DXIT: JSR     PC,PUTWD        ; INSERT IT
         174444
24 004204 004767 $DXIT0: JSR    PC,INSERT       ; FLAG INSERT READY
         174534
25 004210 000167        JMP     CKRPAR          ; CK ")" AND EXIT TO USER
         174102
26                      .IFDF   $DISK
```



```
1                       .SBTTL  "VECT" ROUTINE
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE
6                       ;       CALL "VECT" (DX, DY [,L,I,F,T] )
7
8 004214        VECT:
9 004214 004767         JSR     PC,BUFTST       ; ANY BUFFER?
         173770
10 004220 005067        CLR     ABS,F           ; RELATIVE SCALE MODE
         177414
11 004224 004767        JSR     PC,ARGGET       ; GET ARGUMENTS
         175536
12 004230 005767        TST     XYBIG           ; SHORT OR LONG MODE?
         175574
13 004234 001006        BNE     VECT0           ; LONG MODE= BRANCH
14 004236 052700        BIS     #104000,R0      ; SET SHORT VECTOR MODE
         104000
15 004242 004767        JSR     PC,PUTSGM       ; SET-GRAPHIC-MODE
         175476
16 004246 000167        JMP     ROOT0           ; FINISH UP IN ROOT ROUTINE
         177614
17 004252 052700 VECT0: BIS     #110000,R0      ; SET LONG VECTOR MODE
         110000
18 004256 004767        JSR     PC,PUTSGM       ; SET-GRAPHIC-MODE
         175462
19 004262 016600        MOV     2(SP),R0        ; GET X
         000002
20 004266 056700        BIS     INVIS,R0        ; FLAG VISIBILITY
         176744
21 004272 056700        BIS     XSIGN,R0        ; FLAG SIGN
         175534
22 004276 004767        JSR     PC,PUTWD        ; INSERT X
         174346
23 004302 016700        MOV     YSIGN,R0        ; GET SIGN OF Y
         175526
24 004306 000300        SWAB    R0
25 004310 006200        ASR     R0              ; MOVE BIT 6 TO BIT 13
26 004312 062600        ADD     (SP)+,R0        ; GET VALUE OF Y
27 004314 005726        TST     (SP)+           ; FIX STACK
28 004316 000730        BR      $DXIT           ; EXIT THROUGH APNT ROUTINE
29                      .IFDF   $DISK
```

```
                        .SBTTL  GENERAL SCALE-UNSCALE ROUTINE
                        .ENDC
                ;       ***************************************
                        ; ROUTINE TO DO SCALING AND UNSCALING
                        ; VALUE TO BE SCALED/UNSCALED AND RESULT ARE IN FAC
                        ; BE CAREFUL ON REGISTERS SAVED ETC.
                ; THIS ROUTINE IS RAISED TO LEVEL 4 SO A LPEN INTERRUPT
                ; WON'T CAUSE A STACK OVERFLOW

04320           SC.USC:
04320 005767            TST     SCAL.F          ; IS THERE ANY SCALING?
      176366
04324 001442            BEQ     SCUSC1          ; NO- EXIT
04326 016746            MOV     PSW,-(SP)       ; SAVE PSW
      177776'
04332 052767            BIS     #200,PSW        ; RAISE TO PR4
      000200
      177776'
04340 010146            MOV     R1,-(SP)        ; SAVE R1
04342 010246            MOV     R2,-(SP)        ; SAVE R2
04344 010346            MOV     R3,-(SP)        ; SAVE R3
04346 010446            MOV     R4,-(SP)        ; SAVE R4
04350 010546            MOV     R5,-(SP)        ; SAVE R5
04352 012702            MOV     #4,R2           ; SET UP COUNT FOR WORD TRANSFER
      000004
04356 005720            TST     (R0)+           ; ADJUST POINTER
04360 014046 SCUSC0:    MOV     -(R0),-(SP)     ; TRANSFER: HI-ORDER=>LO-ADDRESS
04362 005302            DEC     R2              ; DECREMENT LOOP COUNT
04364 001375            BNE     SCUSC0          ; BRANCH IF NOT DONE
04366 012767            MOV     #ERSTAR,SERVEC  ; ERROR VECTOR FOR MULT.
      004434'
      000000G
04374 004767            JSR     PC,@IKPOL       ; ENTER POLISH MODE
      173712
04400 004574'                   +PUSHF          ; FLOAT FAC TO STACK
04402 000000G                   +$MLR           ; MULTIPLY
04404 004456'                   +RELABS         ; RELATIVE OR ABSOLUTE SCALE?
04406 000000G                   +$ADR           ; DO ADDITION IF ABSOLUTE
04410 000256'                   +POP            ; PUT RESULT IN FAC
04412 004414'                   .+2             ; EXIT POLISH
04414 012605            MOV     (SP)+,R5        ; GET BACK R5
04416 012604            MOV     (SP)+,R4
04420 012603            MOV     (SP)+,R3
04422 012602            MOV     (SP)+,R2        ; RESTORE REGISTERS
04424 012601            MOV     (SP)+,R1
04426 012667            MOV     (SP)+,PSW       ; RESTORE PSW
      177776'
04432 000207 SCUSC1:    RETURN

                ;       *** GOES QUITE DEEP IN STACK  --12 WORDS?

04434           ERSTAR:
04434 104400            TRAP    0
04436     117           .ASCII  /OVF/
04437     126
```



```
04440     106
04441     000           .BYTE   0
                        .EVEN
04442 020027 ERRDIV:    CMP     R0,#4000
      004000
04446 103772            BLO     ERSTAR
04450 104400            TRAP    0
04452     104           .ASCII  /DV0/
04453     126
04454     060
04455     000           .BYTE   0
                        .EVEN

                        .IFDF   $DISK
```

```
1                       .SBTTL  MISCELLANEOUS ROUTINES
2                       .ENDC
3               ;       ****************************************
4
5                       ; SOME AUXILIARY ROUTINES NEEDED
6
7 004456 005767 177156  RELABS: TST     ABS,F           ; RELATIVE OR ABSOLUTE SCALE?
8 004462 001401         RELAB0: BEQ     RELAB0          ; BRANCH IF RELATIVE
9 004464 000134                 POLRET                  ; DO ADDITION STEP IF ABSOLUTE
10 004466 012665 000040 RELAB0: MOV     (SP)+,FAC1(R5)
11 004472 012665 000042         MOV     (SP)+,FAC2(R5)  ; STORE RESULT IN FAC
12 004476 022626                CMP     (SP)+,(SP)+     ; CLEAR STACK OF ADD CONSTANT
13 004500 000164 000006         JMP     6(R4)           ; EXIT- PAST ADD AND POP
14
15 004504 012767 004442' 000000G DIVVEC: MOV    #ERRDIV,SERVEC  ; ERROR VECTOR FOR DIVISION
16 004512 000134                POLRET
17
18              ;       ****************************************
19
20                      ; SOME POLISH ROUTINES (AGAIN)
21
22 004514               POSX:
23 004514 005767 175312         TST     XSIGN           ; CK SIGN OF X
24 004520 000402                BR      POS0            ; BR WITH CONDX CODES SET
25 004522               POSY:
26 004522 005767 175306         TST     YSIGN           ; CK SIGN OF Y
27 004526 001401 POS0:  BEQ     POS1            ; BR IF R0 >=0
28                      .IFDF   $CRASH
29                      JMP     ERRAOR          ; ARGUMENT OUT OF RANGE
30                      .ENDC
31                      .IFNDF  $CRASH
32 004530 005000                CLR     R0              ; MAKE R0 = 0
33                      .ENDC
34 004532 000134 POS1:  POLRET
35
36 004534               ERRAOR:
37 004534 104400                TRAP    0
38                      .IFNDF  $LONGER
39 004536     101               .ASCII  /AOR/
   004537     117
   004540     122
40                      .ENDC
41                      .IFDF   $LONGER
42                      .ASCII  /ARGUMENT OUT OF RANGE/
43                      .ENDC
44 004541     000               .BYTE   0
45                      .EVEN
46
47 004542 010146 SAVER1: MOV     R1,-(SP)        ; SAVE ONLY R1 ON STACK
```



```
48 004544 000134                POLRET
49
50 004546 012602 REVRSE: MOV     (SP)+,R2
51 004550 012603                MOV     (SP)+,R3
52 004552 016646 000002         MOV     2(SP),-(SP)
53 004556 016646 000002         MOV     2(SP),-(SP)
54 004562 010366 000006         MOV     R3,6(SP)
55 004566 010266 000004         MOV     R2,4(SP)
56 004572 000134                POLRET
57
58 004574 016546 000042 PUSHF:  MOV     FAC2(R5),-(SP)
59 004600 016546 000040         MOV     FAC1(R5),-(SP)
60 004604 001015                BNE     PSHXIT          ; EXIT IF REAL ALREADY
61 004606 005726                TST     (SP)+
62 004610 010167 000026         MOV     R1,M1
63 004614 010467 000024         MOV     R4,M2
64 004620 004767 173466         JSR     PC,QIKPOL
65 004624 000000G                       +$IR
66 004626 004630'                       .+2
67 004630 016701 000006         MOV     M1,R1
68 004634 016704 000004         MOV     M2,R4
69 004640 000134 PSHXIT: POLRET
70
71 004642 000000 M1:    .WORD 0
72 004644 000000 M2:    .WORD 0
73                      .IFDF   $DISK
```

```
                        .SBTTL  "TRAK" ROUTINE
                        .ENDC
                ;       ****************************************

                        ; ROUTINE TO HANDLE
                        ;       CALL "TRAK" (X,Y)
                        ;  BECAUSE OF "GETADR", X AND Y MUST BE
                        ;       VARIABLES, NOT CONSTANTS!

004646          TRAK:
004646 004767           JSR     PC,BUFTST       ; ANY BUFFER?
       173336
004652 010667           MOV     SP,ABS,F        ; FLAG ABSOLUTE MODE
       176762
004656 004767           JSR     PC,POLENT       ; ENTER POLISH MODE, CK "("
       173406
004662 004542'                  +SAVER1         ; SAVE PTR TO X
004664 000136'                  +GETONE         ; GET X
004666 004770'                  +SCALEX         ; SCALE IT
004670 000514'                  +POSX           ; MAKE SURE >=0
004672 001452'                  +SAVER0         ; SAVE X ON STACK
004674 000076'                  +GETNUM         ; GET Y
004676 005042'                  +SCALEY         ; SCALE IT
004700 004522'                  +POSY           ; MAKE SURE >=0
004702 004704'                  .+2             ; EXIT POLISH WITH Y IN R0
004704 012767           MOV     #DJMP,BEG       ; TURN OFF TRAK IF IT WAS ON
       160000
       003574
004712 010067           MOV     R0,YT           ; STORE Y IN TRAK
       003610
004716 012667           MOV     (SP)+,XT        ; STORE X IN TRAK
       003602
004722 012601           MOV     (SP)+,R1        ; RESET TOKEN PTR TO X
004724 004767           JSR     PC,GETADR       ; GET ITS ADDRESS IN R2
       175106
004730 010267           MOV     R2,TRAKX        ; STORE THE ADDRESS
       000030
004734 004767           JSR     PC,ENTERP       ; IMMED POLISH
       173216
004740 001702'                  +CKOPCM         ; CK COMMA
004742 004767           JSR     PC,GETADR       ; GET ADDRESS OF Y
       175070
004746 010267           MOV     R2,TRAKY        ; STORE ADDRESS OF Y
       000014
                ; *** START TRAK AND EXIT
004752 012767           MOV     #SDINT,BEG      ; START TRAK
       173400
       003526
004760 000167           JMP     CKRPAR          ; CK ")" AND EXIT TO USER
       173332

004764 000000 TRAKX:    .WORD 0                 ; ADDRESS OF CURRENT X VARIABLE
004766 000000 TRAKY:    .WORD 0                 ; ADDRESS OF CURRENT Y VARIABLE
                        .IFDF   $DISK
```



```
                        .SBTTL  POLISH SCALEX AND SCALEY
                        .ENDC
                ;       ****************************************

                        ; ROUTINES (POLISH) TO SCALE X OR Y
                        ; SCALES FAC, SETS SIGN BIT, MAKE VALUE POS., CK IF > 1023

004770          SCALEX:
004770 005067           CLR     XSIGN           ; ASSUME X >= 0
       175036
004774 012700           MOV     #SCL.X,R0       ; SET UP FOR SCALE X
       006402'
005000 004767           JSR     PC,SC.USC       ; SCALE AS REQUIRED
       177314
005004 004767           JSR     PC,INT          ; INTEGERIZE
       000000G
005010 005765           TST     FAC1(R5)        ; DID WE SUCCEED?
       000040
005014 001402           BEQ     XSCL0           ; YES- BRANCH
005016 000167 XSCL2:    JMP     ERRAOR          ; NO- CRASH
       177512
005022 016500 XSCL0:    MOV     FAC2(R5),R0     ; MOVE RESULT TO R0
       000042
005026 002030           BGE     YSCL1           ; BRANCH IF >=0
005030 012767           MOV     #20000,XSIGN    ; MAKE BIT 13 ON IF NEGATIVE
       020000
       174774
005036 005400           NEG     R0              ; MAKE R0 > 0
005040 000423 XSCL1:    BR      YSCL1           ; CHECK R0 < 1024
005042          SCALEY:
005042 005067           CLR     YSIGN           ; ASSUME Y >= 0
       174766
005046 012700           MOV     #SCL.Y,R0       ; SET UP FOR SCALE Y
       006372'
005052 004767           JSR     PC,SC.USC       ; SCALE IT
       177242
005056 004767           JSR     PC,INT          ; INTEGERIZE IT < 32767?
       000000G
005062 005765           TST     FAC1(R5)        ;
       000040
005066 001401           BEQ     YSCL0           ; YES- BRANCH
005070 000752           BR      XSCL2           ; NO- CRASH
005072 016500 YSCL0:    MOV     FAC2(R5),R0     ; MOVE RESULT TO R0
       000042
005076 002004           BGE     YSCL1           ; BRANCH IF >=0
005100 012767           MOV     #100,YSIGN      ; SET BIT 6 IF NEGATIVE
       000100
       174726
005106 005400           NEG     R0              ; MAKE R0 > 0
005110 020027 YSCL1:    CMP     R0,#2000        ; COMPARE WITH 1024
       002000
005114 002402           BLT     YSCL2           ; BRANCH IF LESS THAN
                        .IFDF   $CRASH
                        BR      XSCL2           ; CRASH
                        .ENDC
                        .IFNDF  $CRASH
005116 012700           MOV     #1777,R0        ; MAKE = 1023
```

```
        001777
40                      .ENDC
41 05122 000134 YSCL2:  POLRET
42                      .IFDF   $DISK
```



```
1                       .SBTTL  "XGRA" AND "YGRA" ROUTINES
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE
6                       ;       CALL "XGRA" (DY, A [,L,I,F,T] )
7                       ;       CALL "YGRA" (DX, A [,L,I,F,T] )
8
9                       ; ARRAY A MUST HAVE AT LEAST 2 ENTRIES
10                      ; IF AN ARRAY IS USED WITH XGRA OR YGRA, THEN
11                      ; THE SS2 ENTRY IN SYMTAB BECOMES -2, -3 RESP.
12                      ; **NOTE THAT THIS MEANS THAT
13                      ; 1) ONLY DIMENSIONED ARRAYS MAY BE USED WITH
14                      ;    THESE ROUTINES, AND
15                      ; 2) THEY MUST HAVE ONLY ONE SUBSCRIPT
16                      ; ** AT PRESENT, SINCE THE PLOTTED DATA IS ABSOLUTE,
17                      ;    AN ARRAY MAY BE USED IN ONLY ONE CALL
18                      ;       (THIS CAN BE CHANGED WITHOUT TOO MUCH TROUBLE)
19
20 05124        XGRA:
21 05124 012767         MOV     #120000,MODE    ; MODE FOR GRAPH-X
         120000
         000542
22 05132 012767         MOV     #-2,SS2TMP      ; NEW VALUE OF SS2
         177776
         000536
23 05140 000406         BR      GRA,0           ; BRANCH AND CONTINUE
24 05142        YGRA:
25 05142 012767         MOV     #124000,MODE    ; MODE FOR GRAPH-Y
         124000
         000524
26 05150 012767         MOV     #-3,SS2TMP      ; NEW SS2 FOR THIS MODE
         177775
         000520
27 05156 004767 GRA.0:  JSR     PC,BUFTST       ; ANY BUFFER?
         173026
28 05162 005067         CLR     ABS,F           ; RELATIVE SCALE
         176452
29 05166 005067         CLR     XYBIG           ; ASSUME <64
         174636
30 05172 004767         JSR     PC,POLENT       ; ENTER POLISH, CK ","
         173072
31 05176 000136'                +GETONE         ; GET DY OR DX RESP.
32 05200 005202'                .+2             ; EXIT POLISH
33 05202 026727         CMP     SS2TMP,#-2      ; XGRA OR YGRA?
         000470
         177776
34 05210 001410         BEQ     GRA,1           ; BRANCH IF XGRA
35 05212 004767         JSR     PC,QIKPOL       ; ENTER POLISH
         173074
36 05216 004770'                +SCALEX         ; SCALE DX IN YGRA
37 05220 004514'                +POSX           ; MAKE SURE >=0
38 05222 005224'                .+2             ; EXIT POLISH
39 05224 012704         MOV     #GRA,3,R4       ; NEW POLISH PC
         005242'
40 05230 000134         POLRET                  ; AND CONTINUE THERE
41 05232 004767 GRA.1:  JSR     PC,QIKPOL       ; ENTER POLISH
```

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```
          173054
42 05236 005042'                  +SCALEY          ; SCALE DY FOR XGRA
43 05240 004522'                  +POSY            ; MAKE >=0
44 05242 001440'GRA,3:            +TST64           ; CHECK IF < 64 AND ONTO STK
45 05244 001702'                  +CKOPCM          ; CHECK OPTIONAL COMMA
46 05246 004542'                  +SAVER1          ; SAVE PTR TO ARRAY
47 05250 000340'                  +SKPARG          ; TO GET BY ARRAY
48 05252 003050'                  +LIFT            ; GET L,I,F,T
49 05254 005256'                  ,+2              ; EXIT POLISH
50 05256 056700          BIS      MODE,R0          ; ADD MODE TO SGM
          000412
51 05262 010167          MOV      R1,MODE          ; TEMP, SAVE PTR TO ")"
          000406
52 05266 004767          JSR      PC,NEWPUT        ; INSERT IT/ FORCE NEW SGM
          173352
53 05272 016600          MOV      2(SP),R0         ; GET SCALED INCREMENT
          000002
54 05276 001001          BNE      GRA1             ; BR IF R0>0
55 05300         GRA0:   ,IFDF    $CRASH
56                       JMP      ERRAOR           ; ARGUMENT OUT OF RANGE
57                       ,ENDC
58                       ,IFNDF   $CRASH
59 05300 005200          INC      R0               ; MAKE R0 = 1
60                       ,ENDC
61 05302 005767 GRA1:    TST      XYBIG            ; EXCEED 63?
          174522
62 05306 001402          BEQ      GRA2             ; NO= BRANCH
63                       ,IFDF    $CRASH
64                       BR       GRA0             ; CRASH
65                       ,ENDC
66                       ,IFNDF   $CRASH
67 05310 012700          MOV      #77,R0           ; MAKE = 63
          000077
68                       ,ENDC
69 05314 052700 GRA2:    BIS      #174100,R0       ; LOAD STAT, REG, B
          174100
70 05320 004767          JSR      PC,PUTWD         ; INSERT IT
          173324
71 05324 012700          MOV      #DJMP,R0         ; FOLLOWED BY DJMP
          160000
72 05330 004767          JSR      PC,PUTWD         ; INSERT IT
          173314
73 05334 012601          MOV      (SP)+,R1         ; POINT AT ARRAY
74 05336 005726          TST      (SP)+            ; CLEAN STK
75 05340 112102          MOVB     (R1)+,R2
76 05342 100411          BMI      GRASYN           ; SHOULD NOT FIND A TOKEN
77 05344 000302          SWAB     R2
78 05346 152102          BISB     (R1)+,R2
79 05350 061502          ADD      (R5),R2          ; ADR IN SYMTAB OF ARRAY
80 05352 121127          CMPB     (R1),#,COMMA     ; BETTER BE FOLLOWED BY A ","
          000000G
81 05356 001407          BEQ      GRA3             ; YES= BRANCH
82 05360 121127          CMPB     (R1),#,RPAR      ; OR MAYBE A ")"
          000000G
83 05364 001404          BEQ      GRA3             ; YES= BRANCH
84 05366 000167 GRASYN:  JMP      ERRSYN           ; SYNTAX ERROR
          000000G
```



```
85 05372 000167 GRAARG:  JMP      ERRARG           ; ARGUMENT ERROR
          000000G
86 05376 022227 GRA3:    CMP      (R2)+,#-2        ; BETTER BE AN ARRAY
          177776
87 05402 001371          BNE      GRASYN           ; NO= ERROR
88 05404 012200          MOV      (R2)+,R0         ; GET ADR OF (SCALAR BEFORE) ARRAY
89 05406 022020          CMP      (R0)+,(R0)+      ; POINT TO A(0)
90 05410 004767          JSR      PC,PUTWD         ; INSERT AFTER DJMP
          173234
91 05414 011201          MOV      (R2),R1          ; IS SS1 >0?
92 05416 003765          BLE      GRAARG           ; NO= ERROR
93 05420 010046          MOV      R0,-(SP)         ; SAVE ADR
94 05422 010200          MOV      R2,R0
95 05424 004767          JSR      PC,PUTWD         ; SAVE ADR OF SS1
          173220
96 05430 012600          MOV      (SP)+,R0         ; RESTORE R0
97 05432 005022          CLR      (R2)+            ; MAKE SS1=0 IN SYMTAB
98 05434 021227          CMP      (R2),#-1         ; CHECK SS2 = -1?
          177777
99 05440 001354          BNE      GRAARG           ; NO= ERROR
100 5442 016712          MOV      SS2TMP,(R2)      ; STORE NEW SS2
          000230
101 5446 010002          MOV      R0,R2            ; STORE START OF SCALED ARRAY
102 5450 010667          MOV      SP,ABS,F         ; ABSOLUTE MODE
          176164
103                      ,IFDF    $LPS
104 5454 005067          CLR      LPS,F            ; ASSUME NOT AN LPS ARRAY
          000114
105 5460 012704          MOV      #NARRAY,R4       ; NO, OF ENTRIES IN BUFFER TABLE
          000000G
106 5464 001413          BEQ      GRA7             ; NOTHING THERE
107 5466 012703          MOV      #TABLE,R3        ; ADR OF FIRST 6-WORD BLOCK
          000000G
108 5472 021300 GRA6:    CMP      (R3),R0          ; ADR, MATCH?
109 5474 001003          BNE      GRA10            ; NO= BRANCH
110 5476 010667          MOV      SP,LPS,F         ; SET LPS FLAG
          000072
111 5502 000404          BR       GRA7             ; EXIT
112 5504 062703 GRA10:   ADD      #12.,R3          ; GO TO NEXT BLOCK
          000014
113 5510 005304          DEC      R4               ; ANY ENTRIES LEFT?
114 5512 003367          BGT      GRA6             ; YES= BRANCH
115                      ,ENDC
116 5514 010003 GRA7:    MOV      R0,R3            ; GET START OF UNSCALED DATA
117                      ,IFDF    $LPS
118 5516 005767          TST      LPS,F            ; AN LPS ARRAY?
          000052
119 5522 001403          BEQ      GRA7A            ; NO= BRANCH
120 5524 006301          ASL      R1               ; YES= DOUBLE ARRAY ENTRIES
121 5526 005401          NEG      R1
122 5530 005201          INC      R1               ; MAKE -DIM+1
123 5532         GRA7A:  ,ENDC
124 5532 010100          MOV      R1,R0
125 5534 004767          JSR      PC,PUTWD         ; STORE SS1 IN DPY FILE
          173110
126                      ,IFDF    $LPS
127 5540 005767          TST      LPS,F            ; AN LPS ARRAY?
```

```
                000030
128 5544 001414         BEQ     GRALP           ; NO= DON'T NEGATE
129 5546 005401         NEG     R1              ; USED >0 HERE
130 5550 005767 GRA9:   TST     LPS,F           ; AN LPS ARRAY?
                000020
131 5554 001410         BEQ     GRALP           ; NO= BRANCH
132 5556 012300         MOV     (R3)+,R0        ; GET DATA
133 5560 010346         MOV     R3,-(SP)        ; SAVE R3
134 5562 010003         MOV     R0,R3           ; SET UP FOR LPS "FLOAT"
135 5564 004767         JSR     PC,FLOAT        ; FLOAT INTO FAC
                000000G
136 5570 012603         MOV     (SP)+,R3        ; RESTORE R3
137 5572 000405         BR      GRALP1          ; AND CONTINUE
138 5574 000000 LPS.F:  .WORD   0               ; NON-ZERO IF LPS ARRAY
139                     .ENDC
140 5576 012365 GRALP:  MOV     (R3)+,FAC1(R5)  ; GET DATA
                000040
141 5602 012365         MOV     (R3)+,FAC2(R5)  ;    AND SECOND WORD
                000042
142                     .IFDF   $LPS
143 5606        GRALP1: .ENDC
144 5606 026727         CMP     SS2TMP,#-2      ; XGRA OR YGRA?
                000064
                177776
145 5614 001405         BEQ     GRA4            ; BR IF XGRA
146 5616 004767         JSR     PC,QIKPOL       ; ENTER POLISH
                172470
147 5622 005042'                +SCALEY         ; SCALE IT TO R0
148 5624 004522'                +POSY           ; MAKE SURE >= 0
149 5626 005642'                +GRA5           ; CONTINUE THERE
150 5630 004767 GRA4:   JSR     PC,QIKPOL       ; ENTER POLISH
                172456
151 5634 004770'                +SCALEX         ; SCALE X TO R0
152 5636 004514'                +POSX           ; MAKE SURE >= 0
153 5640 005642'                .+2             ; EXIT POLISH MODE
154 5642 052700 GRA5:   BIS     #40000,R0       ; MAKE VISIBLE
                040000
155 5646 010022         MOV     R0,(R2)+        ; STORE SCALED VALUE
156 5650 005301         DEC     R1              ; DECREMENT COUNT
157                     .IFDF   $LPS
158 5652 002336         BGE     GRA9            ; LOOP
159                     .ENDC
160                     .IFNDF  $LPS
161                     BGE     GRALP           ; LOOP
162                     .ENDC
163 5654 016701         MOV     MODE,R1         ; RESTORE R1
                000014
164 5660 012722 SDXIT1: MOV     #DJMP,(R2)+     ; INSERT DJMP
                160000
165 5664 016712         MOV     DISEND,(R2)     ; AND ADDRESS
                172746
166 5670 000167         JMP     SDXIT0          ; CK ")" AND EXIT TO USER
                176310
167
168 5674 000000 MODE:   .WORD   0               ; GRAPH-X OR GRAPH-Y MODE
169 5676 000000 SS2TMP: .WORD   0               ; NEW VALUE OF SS2MAX
170                     .IFDF   $DISK
```



```
1                       .SBTTL  "SCAL" ROUTINE
2                       .ENDC
3                ;      ***************************************
4
5                       ; ROUTINE TO HANDLE
6                       ;       CALL "SCAL"(LLX,LLY,URX,URY [,INX,INY])
7
8 005700        SCAL:
9 005700 004767         JSR     PC,BUFPOL       ; ENTER POLISH AND CK "("
                172300
10 05704 000136'                +GETONE         ; GET LLX
11 05706 004574'                +PUSHF          ; FLOAT TO STK
12 05710 000026'                +PLOOP          ; POLISH LOOP
13 05712 000002                 +2              ; TWICE
14 05714 000076'                +GETNUM         ; GET ",LLY,URX"
15 05716 004574'                +PUSHF          ; FLOAT TO STK
16 05720 000040'                +ELOOP          ; END POLISH LOOP
17 05722 004546'                +REVRSE         ; REVERSE LLU AND URX
18 05724 000076'                +GETNUM         ; GET URY
19 05726 004574'                +PUSHF          ; FLOAT TO STK
20 05730 005732'                .+2             ; EXIT POLISH, CK INX, INY LATER
21 05732 016667         MOV     4(SP),LLY       ;
                000004
                000410
22 05740 016667         MOV     6(SP),LLY+2     ; SAVE LLY
                000006
                000404
23 05746 016667         MOV     12.(SP),LLX     ;
                000014
                000404
24 05754 016667         MOV     14.(SP),LLX+2   ; SAVE LLX
                000016
                000400
25 05762 004467         JSR     R4,FPPSAV       ; ENTER POLISH AND SAVE REGISTER
                172430
26 05766 006234'                +MULVEC         ; LOAD ERROR VECTOR FOR SUBTRACT
27 05770 000000G                +$SBR           ; LLY=URY
28 05772 000176'                +NEGSTK         ; URY=LLY
29 05774 000256'                +POP            ; SAVE IN FAC
30 05776 000000G                +$SBR           ; LLX=URX
31 06000 000176'                +NEGSTK         ; URX=LLX
32 06002 000442'                +FPPRES         ; RESTORE REGS, AND EXIT POLISH
33 06004 012667         MOV     (SP)+,FX
                000364
34 06010 012667         MOV     (SP)+,FX+2      ; SAVE URX-LLX TEMPORARILY
                000362
35 06014 012767         MOV     #USCL.Y,SCPTR   ; POINTER = LLY+2
                006352'
                000166
36 06022 004767         JSR     PC,SCLGEN       ; GENERATE SCALE IN Y
                000216
37 06026 012667         MOV     (SP)+,FYL
                000336
38 06032 012667         MOV     (SP)+,SCL.Y     ; STORE FYL = -FY*LLY
                000334
39 06036 012667         MOV     (SP)+,IFY
                000302
```

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```
40 06042 012667          MOV     (SP)+,IFY+2     ; STORE IFY = 1/FY
         000300
41 06046 016567          MOV     FAC1(R5),FY
         000040
         000310
42 06054 016567          MOV     FAC2(R5),FY+2   ; STORE FY
         000042
         000304
43 06062 016765          MOV     FX,FAC1(R5)
         000306
         000040
44 06070 016765          MOV     FX+2,FAC2(R5)   ; PUT URX=LLX IN FAC
         000302
         000042
45 06076 012767          MOV     #USCL.X,SCPTR   ; POINTER = LLX+2
         006362'
         000104
46 06104 004767          JSR     PC,SCLGEN       ; GENERATE SCALE IN X
         000134
47 06110 012667          MOV     (SP)+,FXL
         000264
48 06114 012667          MOV     (SP)+,SCL.X     ; STORE FXL = -FX*LLX
         000262
49 06120 012667          MOV     (SP)+,IFX
         000230
50 06124 012667          MOV     (SP)+,IFX+2     ; STORE IFX = 1/FX
         000226
51 06130 016567          MOV     FAC1(R5),FX     ; STORE FX
         000040
         000236
52 06136 016567          MOV     FAC2(R5),FX+2
         000042
         000232
53 06144 012700          MOV     #FX,R0          ; SET UP SOURCE VARIABLE ADDRESS
         006374'
54 06150 004767          JSR     PC,OPTSTR       ; STORE INX = FX IF USER WANTS IT
         000142
55 06154 016765          MOV     FY,FAC1(R5)
         000204
         000040
56 06162 016765          MOV     FY+2,FAC2(R5)   ; MOVE FY TO FAC
         000200
         000042
57 06170 012700          MOV     #FY,R0          ; SET UP SOURCE VARIABLE ADDRESS
         006364'
58 06174 004767          JSR     PC,OPTSTR       ; STORE INY = FY IF USER WANTS IT
         000116
59 06200 010667 SCAL0:   MOV     SP,SCAL.F       ; SCALING HAS BEEN DONE
         174506
60 06204 000167          JMP     CKRPAR          ; CK ")" AND EXIT TO USER
         172106
61
62 06210 000000 SCPTR:   .WORD 0                 ; PTR FOR A POLISH ROUTINE
63                       .IFDF   $DISK
64                       .EOT
```



```
2                ;
3                ;       DEC - 11 - LBPGB - A - LA    BASIC KERNEL V02-01
4                ;
5                ;       GTB,MAC TAPE 4 OF 4
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23               ;
24               ;       AUTHOR: DR. STEPHEN R. ALPERT   AUGUST 1973
25                       .SBTTL  ROUTINES AUXILIARY TO "SCAL"
26                       .ENDC
27               ;       ****************************************
28
29                       ; SOME NECESSARY ROUTINES TO ACCOMPLISH SCALING
30
31 06212         PSHPTR:
32 06212 016700          MOV     SCPTR,R0        ; R0 HAS ADDRESS OF LO-ORDER WORD
         177772
33 06216 011046          MOV     (R0),-(SP)      ; MOVE TO STK
34 06220 014046          MOV     -(R0),-(SP)
35 06222 000134          POLRET
36
37 06224         TEN24:
38 06224 005046          CLR     -(SP)
39 06226 012746          MOV     #42600,-(SP)    ; PUT 1024. ON STK
         042600
40 06232 000134          POLRET
41
42 06234         MULVEC:
43 06234 012767          MOV     #ERSTAR,SERVEC  ; MULT. ERROR VECTOR
         004434'
         000000G
44 06242 000134          POLRET
45
46               ;       ****************************************
47
48                       ; SCALE GENERATOR ROUTINE
49                       ; ON EXIT:
50                       ;       FX IN FAC
51                       ;       FXL AT (SP), 2(SP)
52                       ;       IFX AT 4(SP), 6(SP)
53
54 06244         SCLGEN:
```

```
55 06244 012667          MOV     (SP)+,SCLSAV    ; SAVE RETURN ADDRESS OFF STK
         000044
56 06250 004467          JSR     R4,FPPSAV       ; SAVE REGS AND ENTER POLISH
         172142
57 06254 000246'                 +PUSH1          ; PUT 1.0 ON STK
58 06256 006224'                 +TEN24          ; PUT 1024. ON STK
59 06260 004504'                 +DIVVEC         ; DIVIDE ERROR VECTOR
60 06262 000234'                 +PUSH           ; PUT FAC ON STK
61 06264 000000G                 +$DVR           ; 1024./DIFF, = FX
62 06266 000256'                 +POP            ; PUT FX IN FAC
63 06270 000234'                 +PUSH           ; PUT BACK ON STK
64 06272 000000G                 +$DVR           ; 1./FX = IFX
65 06274 000234'                 +PUSH           ; FX ONTO STK AGAIN
66 06276 000176'                 +NEGSTK         ; NOW -FX
67 06300 006212'                 +PSHPTR         ; PUT LLX ON STK
68 06302 006234'                 +MULVEC         ; MULT. ERROR VECTOR
69 06304 000000G                 +$MLR           ; FXL = -FX*LLX
70 06306 000442'                 +FPPRES         ; EXIT POLISH AND RESTORE REGS
71 06310 000177          JMP     @SCLSAV         ; RETURN TO CALLER
         000000
72
73 06314 000000 SCLSAV: .WORD 0                  ; RETURN ADDRESS
74                       .IFDF   $DISK
```



```
1                        .SBTTL  OPTIONAL STORE ROUTINE AND DATA LAYOUT FOR SCAL
2                        .ENDC
3                ;       ****************************************
4
5                        ; ROUTINE TO OPTIONALLY STORE (R0),2(R0) IN NEXT PARAM
6                        ;       IF THERE IS ONE,
7                        ; R1 POINTS TO COMMA BEFORE PARAMETER
8                        ; R0 POINTS TO ENTRY TO BE MOVED
9
10 06316         OPTSTR:
11 06316 004767          JSR     PC,QIKPOL       ; ENTER POLISH
         171770
12 06322 000066'                 +SETOPT         ; SET OPTIONAL FLAG
13 06324 001702'                 +CKOPCM         ; CK OPTIONAL ","
14 06326 006330'                 .+2             ; EXIT POLISH
15 06330 103404          BCS     OPTST0          ; NO- A RIGHT PAREN
16 06332 004767          JSR     PC,GETADR       ; GET ADR IN R2
         173500
17 06336 012022          MOV     (R0)+,(R2)+
18 06340 012022          MOV     (R0)+,(R2)+     ; STORE RESULT
19 06342 000207 OPTST0:  RETURN
20
21               ;       ****************************************
22
23                       ; DATA STORAGE FOR SCALING
24
25 06344 000000 IFY:     .WORD 0,0               ; IFY = 1/FY
   06346 000000
26 06350 000000 LLY:     .WORD 0                 ; LLY
27 06352 000000 USCL.Y:  .WORD 0
28
29 06354 000000 IFX:     .WORD 0,0               ; IFX = 1/IFY
   06356 000000
30 06360 000000 LLX:     .WORD 0                 ; LLX
31 06362 000000 USCL.X:  .WORD 0
32
33 06364 000000 FY:      .WORD 0,0               ; FY
   06366 000000
34 06370 000000 FYL:     .WORD 0                 ; FYL = -FY*LLY
35 06372 000000 SCL.Y:   .WORD 0
36
37 06374 000000 FX:      .WORD 0,0               ; FX
   06376 000000
38 06400 000000 FXL:     .WORD 0                 ; FXL = IFX*LLX
39 06402 000000 SCL.X:   .WORD 0
40                       .IFDF   $DISK
```

```
                        .SBTTL  POLISH ROUTINE TO SORT VARIABLE TYPES
                        .ENDC
                ;       ****************************************

                        ; ROUTINE (POLISH) TO RETURN IN R0
                        ;   -1 IF ARGUMENT IS SCALAR OR REGULAR ARRAY
                        ;    0 IF XGRA ARRAY
                        ;    2 IF YGRA ARRAY
                        ;    4 IF FIGR ARRAY
                        ; ** CRASH IF A STRING ARGUMENT
                        ; R1 POINTS TO PARAMETER IN TOKEN FORM

 06404          ADRCHK:
 06404 004767           JSR     PC,GETADR       ; GET THE ADDRESS
       173426
 06410 016500           MOV     VARSAV(R5),R0   ; GET POINTER TO SYMTAB ENTRY
       000022
 06414 021027           CMP     (R0),#-2        ; ARRAY OR SCALAR?
       177776
 06420 001404           BEQ     ADRCH0          ; BRANCH IF ARRAY
 06422 003015           BGT     ADRCH3          ; BRANCH IF SCALAR
 06424 012700 ADRCH1:   MOV     #-1,R0          ; FLAG AS -1
       177777
 06430 000134 ADRCH2:   POLRET                  ; AND EXIT
 06432 016000 ADRCH0:   MOV     6(R0),R0        ; GET SS2MAX
       000006
 06436 005200           INC     R0
 06440 002371           BGE     ADRCH1          ; BRANCH IF SS2MAX >=-1
 06442 005200           INC     R0
 06444 005400           NEG     R0
 06446 006300           ASL     R0              ; R0 <-- -2 * (R0 + 1)
 06450 020027           CMP     R0,#4           ; BETTER NOT BE >4
       000004
 06454 003765           BLE     ADRCH2          ; IT ISN'T, EXIT
 06456 000167 ADRCH3:   JMP     ERRARG          ; IT IS, FAIL
       000000G
                        .IFDF   $DISK
```



```
                        .SBTTL  "APUT" ROUTINE
                        .ENDC
                ;       ****************************************

                        ; ROUTINE TO HANDLE
                        ;       CALL "APUT" ( A(I), Z)
                        ; "A" MUST BE XGRA, YGRA OR FIGR ARRAY
                        ; "Z" CANNOT BE ANY OF THE ABOVE

 06462          APUT:
 06462 004767           JSR     PC,BUFPOL       ; ENTER POLISH AND CK "("
       171516
 06466 004542'          +SAVER1                 ; R1 TO STK (PTR TO A(I) )
 06470 000340'          +SKPARG                 ; SKIP OVER A(I)
 06472 000076'          +GETNUM                 ; CK "," AND GET VALUE OF Z
 06474 004542'          +SAVER1                 ; SAVE PTR TO ")" ON STK
 06476 000234'          +PUSH                   ; SAVE Z ON STK
 06500 006502'          .+2                     ; END POLISH MODE
 06502 016601           MOV     6(SP),R1        ; POINT AT A(I) AGAIN
       000006
 06506 004767           JSR     PC,QIKPOL       ; IMMED, POLISH
       171600
 06512 006404'          +ADRCHK                 ; CHECK ITS TYPE
 06514 000256'          +POP                    ; PUT Z BACK IN FAC
 06516 006520'          .+2                     ; EXIT POLISH
 06520 005700           TST     R0              ; XGRA, YGRA, OR FIGR?
 06522 002002           BGE     APUT1           ; YES- BRANCH
 06524 000167           JMP     ERRARG          ; NO- CRASH
       000000G
 06530 010266 APUT1:    MOV     R2,2(SP)        ; SAVE ADR OF A(I) OVER PTR TO A(I)
       000002
 06534 010667           MOV     SP,ABS,F        ; ABSOLUTE MODE (XGRA,YGRA)
       175100
 06540 016007           MOV     T1(R0),PC       ; DISPATCH
       006544'
 06544 006552'T1:               +APUTX          ; XGRA
 06546 006564'                  +APUTY          ; YGRA
 06550 006576'                  +APUTF          ; FIGR
 06552 004767 APUTX:    JSR     PC,QIKPOL       ; ENTER POLISH
       171534
 06556 004770'                  +SCALEX         ; SCALE IT
 06560 004514'                  +POSX           ; MAKE SURE >=0
 06562 006646'                  +APUT2          ; CONTINUE AT APUT2
 06564 004767 APUTY:    JSR     PC,QIKPOL       ; ENTER POLISH
       171522
 06570 005042'                  +SCALEY         ; SCALE IT
 06572 004522'                  +POSY           ; MAKE SURE >=0
 06574 006646'                  +APUT2          ; CONTINUE AT APUT2
 06576 005067 APUTF:    CLR     ABS,F           ; FLAG RELATIVE MODE
       175036
 06602 006065           ROR     SS1SAV(R5)      ; X OR Y ENTRY?
       000024
 06606 103012           BCC     APUTF0          ; X- BRANCH
 06610 004767           JSR     PC,ENTERP       ; IMMED, POLISH
       171342
 06614 005042'                  +SCALEY         ; SCALE Y
 06616 000367           SWAB    YSIGN
```

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          173212
46 06622 006267          ASR     YSIGN           ; MOVE SIGN TO BIT 13
          173206
47 06626 056700          BIS     YSIGN,R0        ; SET SIGN BIT IN ANSWER
          173202
48 06632 000405          BR      APUT2           ; CONTINUE AT APUT2
49 06634 004767 APUTF0:  JSR     PC,ENTERP       ; IMMED. POLISH
          171316
50 06640 004770'                 +SCALEX         ; SCALE X
51 06642 056700          BIS     XSIGN,R0        ; SET SIGN BIT
          173164
52 06646               APUT2:
53 06646 012601          MOV     (SP)+,R1        ; POINT TO ")"
54 06650 017646          MOV     @(SP),-(SP)     ; GET VALUE
          000000
55 06654 042716          BIC     #137777,(SP)    ; CLEA ALL BUT VISIBILITY
          137777
56 06660 050016          BIS     R0,(SP)         ; SET IN VALUE
57 06662 012636          MOV     (SP)+,@(SP)+    ; STORE A(I)
58 06664 000464          BR      AGET4           ; EXIT THRU CKRPAR
59                       .IFDF   $DISK
```



```
1                        .SBTTL  "AGET" ROUTINE
2                        .ENDC
3                ;       ****************************************
4
5                        ; ROUTINE TO HANDLE:
6                        ;       CALL "AGET" ( A(I), Z)
7                        ; "A" MUST BE XGRA, YGRA, OR FIGR ARRAY
8                        ; "Z" MUST NOT BE ANY OF THE ABOVE
9
10 06666               AGET:
11 06666 004767          JSR     PC,BUFPOL       ; ENTER POLISH AND CK "("
          171312
12 06672 006404'                 +ADRCHK         ; CK ADR OF A(I)
13 06674 001702'                 +CKOPCH         ; CK ","
14 06676 006700'                 .+2             ; EXIT POLISH
15 06700 005700          TST     R0              ; XGRA, YGRA, OR FIGR?
16 06702 002002          BGE     AGET0           ; YES- BRANCH AND CONTINUE
17 06704 000167 AGET3:   JMP     ERRARG          ; NO- CRASH
          000000G
18 06710 010667 AGET0:   MOV     SP,ABS.F        ; ABSOLUTE MODE
          174724
19 06714 011265          MOV     (R2),FAC2(R5)   ; GET VALUE FROM ARRAY
          000042
20 06720 005065          CLR     FAC1(R5)        ;       INTO FAC
          000040
21 06724 042765          BIC     #40000,FAC2(R5) ; CLEAR INTENSITY BIT
          040000
          000042
22 06732 016007          MOV     T0(R0),PC       ; DISPATCH
          006736'
23 06736 006744'T0:              +AGETX          ; XGRA
24 06740 007004'                 +AGETY          ; YGRA
25 06742 006752'                 +AGETF          ; FIGR
26 06744 012700 AGETX:   MOV     #USCL.X,R0      ; UNSCALE XGRA
          006362'
27 06750 000417          BR      AGET1           ; AND CONTINUE
28 06752 032712 AGETF:   BIT     #20000,(R2)     ; LONG VECTOR <0?
          020000
29 06756 001405          BEQ     AGET2           ; NO- BRANCH
30 06760 005465          NEG     FAC2(R5)        ; YES- NEGATE IT
          000042
31 06764 052765          BIS     #176000,FAC2(R5) ; MAKE IT TRUE NEGATIVE
          176000
          000042
32 06772 005067 AGET2:   CLR     ABS.F           ; FIGR IS RELATIVE
          174642
33 06776 006065          ROR     $S1SAV(R5)      ; X OR Y ENTRY?
          000024
34 07002 103360          BCC     AGETX           ; X- BRANCH
35 07004 012700 AGETY:   MOV     #USCL.Y,R0      ; UNSCALE YGRA
          006352'
36 07010 004767 AGET1:   JSR     PC,SC.USC       ; DO IT NOW
          175304
37 07014 004767          JSR     PC,GIKPOL       ; ENTER POLISH
          171272
38 07020 000234'                 +PUSH           ; PUSH FAC ON STK
39 07022 006404'                 +ADRCHK         ; CK ADR OF Z
```

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```
40 07024 007026'                .+2             ; EXIT POLISH
41 07026 005700         TST     R0              ; XGRA, YGRA, OR FIGR?
42 07030 002325         BGE     AGET3           ; YES- ERROR => CRASH
43 07032 012622         MOV     (SP)+,(R2)+     ; STORE UNSCALED RESULT
44 07034 012622         MOV     (SP)+,(R2)+     ;       AND REST OF IT
45 07036 000167 AGET4:  JMP     CKRPAR          ; CK ")" AND EXIT TO USER
         171254
46                      .IFDF   $DISK
```



```
1                       .SBTTL  "FIGR" ROUTINE
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE:
6                       ;       CALL "FIGR" (A [, L, I, F, T ] )
7
8 007042        FIGR:
9 007042 004767         JSR     PC,BUFPOL       ; ENTER POLISH AND CK "("
         171136
10 07046 004542'                +SAVER1         ; SAVE PTR TO A ON STK
11 07050 000340'                +SKPARG         ; DON'T TRY TO EVALUATE IT
12 07052 003050'                +LIFT           ; GET L, I, F, T
13 07054 004542'                +SAVER1         ; SAVE PTR TO ")"
14 07056 007060'                .+2             ; EXIT POLISH
15 07060 052700         BIS     #110000,R0      ; LONG VECTOR MODE
         110000
16 07064 004767         JSR     PC,NEWPUT       ; INSERT SGM WORD
         171554
17 07070 016601         MOV     2(SP),R1        ; POINT AT A
         000002
18 07074 012616         MOV     (SP)+,(SP)      ; CLEAN STK A BIT
19 07076 112102         MOVB    (R1)+,R2
20 07100 100512         BMI     FIGSYN          ; ERROR IF TOKEN HERE
21 07102 000302         SWAB    R2
22 07104 152102         BISB    (R1)+,R2
23 07106 061502         ADD     (R5),R2         ; OFFSET TO SYMTAB
24 07110 022227         CMP     (R2)+,#-2       ; BETTER BE AN ARRAY
         177776
25 07114 001104         BNE     FIGSYN          ; NO- ERROR
26 07116 012700         MOV     #DJMP,R0
         160000
27 07122 004767         JSR     PC,PUTWD        ; INSERT DJMP
         171522
28 07126 012200         MOV     (R2)+,R0        ; GET ADDRESS OF ARRAY
29 07130 022020         CMP     (R0)+,(R0)+     ; POINT AT A(0)
30 07132 010003         MOV     R0,R3           ; PUT IN R3 ALSO
31 07134 004767         JSR     PC,PUTWD        ; INSERT IN DPY FILE
         171510
32 07140 011201         MOV     (R2),R1         ; IS SS1 >0?
33 07142 003467         BLE     FIGARG          ; NO- ERROR (NOT ENUF ROOM)
34 07144 005301         DEC     R1              ; TO ROUND CORRECTLY
35 07146 052701         BIS     #1,R1           ; MAKE ODD
         000001
36 07152 010200         MOV     R2,R0
37 07154 004767         JSR     PC,PUTWD        ; ADR OF SS1
         171470
38 07160 010100         MOV     R1,R0
39 07162 004767         JSR     PC,PUTWD        ; SAVE SS1 IN DPY FILE
         171462
40 07166 005022         CLR     (R2)+           ; ZERO SS1 IN SYMTAB
41 07170 005201         INC     R1              ; ONE MORE SINCE ZERO TOO
42 07172 021227         CMP     (R2),#-1        ; CHECK SS2 = -1?
         177777
43 07176 001051         BNE     FIGARG          ; NO- ERROR
44 07200 012712         MOV     #-4,(R2)        ; STORE -4 IN SS2MAX
         177774
```

```
45 07204 010302          MOV     R3,R2           ; ALSO IN R2
46 07206 005067          CLR     ABS,F           ; RELATIVE MODE
         174426
47 07212 005067          CLR     SS2TMP          ; SWITCH FOR TOGGLING
         176460
48 07216 012365 FIGRLP:  MOV     (R3)+,FAC1(R5)  ; GET ARRAY ELEMENT
         000040
49 07222 012365          MOV     (R3)+,FAC2(R5)  ; GET SECOND HALF
         000042
50 07226 005767          TST     SS2TMP          ; X OR Y ENTRY?
         176444
51 07232 001010          BNE     FIGR1           ; Y= BRANCH
52 07234 005267          INC     SS2TMP          ; MAKE Y NEXT TIME
         176436
53 07240 004767          JSR     PC,ENTERP       ; IMMED. POLISH
         170712
54 07244 004770'                 +SCALEX         ; SCALE X RELATIVE
55 07246 056700          BIS     XSIGN,R0        ; PUT IN SIGN
         172560
56 07252 000413          BR      FIGR2           ; INSERT IT AND CONTINUE
57 07254 005067 FIGR1:   CLR     SS2TMP          ; MAKE X NEXT TIME
         176416
58 07260 004767          JSR     PC,ENTERP       ; IMMED. POLISH
         170672
59 07264 005042'                 +SCALEY         ; SCALE Y RELATIVE
60 07266 000367          SWAB    YSIGN           ; SET SIGN BIT IN BIT 13
         172542
61 07272 006267          ASR     YSIGN           ; ALL SET
         172536
62 07276 056700          BIS     YSIGN,R0        ; SET IN R0
         172532
63 07302 056700 FIGR2:   BIS     INVIS,R0        ; FLAG VISIBLE OR NOT
         173730
64 07306 010022          MOV     R0,(R2)+        ; INSERT SCALED WORD
65 07310 005301          DEC     R1
66 07312 003341          BGT     FIGRLP          ; LOOP IF NOT DONE
67 07314 012601          MOV     (SP)+,R1        ; POINT R1 AT ")"
68 07316 000167          JMP     $DXIT1          ; INSERT/ CK ")"/ EXIT TO USER
         176336
69 07322 000167 FIGARG:  JMP     ERRARG          ; ARGUMENT ERROR
         000000G
70 07326 000167 FIGSYN:  JMP     ERRSYN          ; SYNTAX ERROR
         000000G
71                       .IFDF   $DISK
```



```
1                        .SBTTL  "FPUT" ROUTINE
2                        .ENDC
3                ;       ****************************************
4
5                        ; ROUTINE TO HANDLE:
6                        ;       CALL "FPUT"(A(I),Z)
7                        ; "A" MUST BE A FIGR ARRAY
8                        ; "Z" MUST NOT BE ANY OF FIGR,XGRA,YGRA
9
10 07332         FPUT:
11 07332 004767          JSR     PC,BUFPOL       ; ENTER POLISH AND CK "("
         170646
12 07336 004542'                 +SAVER1         ; SAVE PTR TO A(I)
13 07340 000340'                 +SKPARG         ; SKIP OVER A(I)
14 07342 000076'                 +GETNUM         ; GET Z INTO FAC
15 07344 004542'                 +SAVER1         ; SAVE PTR TO ")"
16 07346 000234'                 +PUSH           ; SAVE Z ON STK
17 07350 007352'                 .+2             ; EXIT POLISH
18 07352 016601          MOV     6(SP),R1        ; POINT R1 AT A(I)
         000006
19 07356 004767          JSR     PC,QIKPOL       ; IMMED. POLISH
         170730
20 07362 006404'                 +ADRCHK         ; CK ADR OF A(I)
21 07364 000256'                 +POP            ; PUT Z INTO FAC
22 07366 007370'                 .+2             ; EXIT POLISH
23 07370 020027          CMP     R0,#4           ; R0 SHOULD BE 4
         000004
24 07374 001402          BEQ     FPUT0           ; YES= BRANCH
25 07376 000167          JMP     ERRARG          ; NO= ERROR
         000000G
26 07402 010266 FPUT0:   MOV     R2,2(SP)        ; REPLACE PTR TO A(I) BY ITS ADR
         000002
27 07406 005067          CLR     ABS,F           ; RELATIVE MODE
         174226
28 07412 006065          ROR     SS1SAV(R5)      ; X OR Y ENTRY?
         000024
29 07416 103013          BCC     FPUT1           ; X= BRANCH
30 07420 004767          JSR     PC,ENTERP       ; IMMED. POLISH
         170532
31 07424 005042'                 +SCALEY         ; SCALE Y TO R0
32 07426 000367          SWAB    YSIGN           ; MOVE SIGN BIT
         172402
33 07432 006267          ASR     YSIGN           ;   TO 13
         172376
34 07436 016767          MOV     YSIGN,XYBIG     ; SAVE SIGN
         172372
         172364
35 07444 000406          BR      FPUT2           ; AND CONTINUE
36 07446 004767 FPUT1:   JSR     PC,ENTERP       ; IMMED. POLISH
         170504
37 07452 004770'                 +SCALEX         ; SCALE X TO R0
38 07454 016767          MOV     XSIGN,XYBIG     ; SAVE SIGN
         172352
         172346
39 07462 016603 FPUT2:   MOV     2(SP),R3        ; ADR OF A(I)
         000002
40 07466 012616          MOV     (SP)+,(SP)      ; CLEAN STACK
```

```
41 07470 004767          JSR     PC,UNDO         ; GET ARG A(I) TO R4
         000106
42 07474 010002          MOV     R0,R2           ; SAVE Z
43 07476 056700          BIS     XYBIG,R0        ; SET SIGN
         172326
44 07502 011346          MOV     (R3),-(SP)      ; GET VALUE
45 07504 042716          BIC     #137777,(SP)    ; CLEAR ALL BUT VISIBILITY
         137777
46 07510 050016          BIS     R0,(SP)         ; SET IN VALUE
47 07512 012613          MOV     (SP)+,(R3)      ; STORE IN A(I)
48 07514 005767          TST     XYBIG           ; Z POS OR NEG?
         172310
49 07520 001401          BEQ     FPUT3           ; POS= BRANCH
50 07522 005402          NEG     R2              ; MAKE CORRECT REPRESENTATION
51 07524 160402 FPUT3:   SUB     R4,R2           ; Z-A(I) IN R2
52 07526 005723          TST     (R3)+           ; LOOK AT NEXT WORD
53 07530 022327          CMP     (R3)+,#DJMP     ; END OF ARRAY?
         160000
54 07534 001417          BEQ     FPUT4           ; YES
55 07536 021327          CMP     (R3),#DJMP      ; END OF ARRAY HERE?
         160000
56 07542 001414          BEQ     FPUT4           ; YES
57 07544 004767          JSR     PC,UNDO         ; GET A(I+2) INTO R4
         000032
58 07550 160204          SUB     R2,R4           ; R4<==A(I+2)-(Z-A(I))
59 07552 002003          BGE     FPUT5           ; BRANCH IF POSITIVE
60 07554 005404          NEG     R4              ; ABS, VAL OF R4
61 07556 052704          BIS     #20000,R4       ; SET SIGN NEG,
         020000
62 07562         FPUT5:
63 07562 011346          MOV     (R3),-(SP)      ; GET VALUE
64 07564 042716          BIC     #137777,(SP)    ; CLEAR ALL BUT VISIBILITY
         137777
65 07570 050416          BIS     R4,(SP)         ; SET NEW VALUE
66 07572 012613          MOV     (SP)+,(R3)      ; STORE NEW A(I+2)
67 07574 012601 FPUT4:   MOV     (SP)+,R1        ; POINT AT ")"
68 07576 000167          JMP     CKRPAR          ; CK ")" AND EXIT TO USER
         170514
69
70               ;       ****************************************
71
72                       ; ROUTINE  UNDO
73                       ; TAKE LONG VECTOR WORD POINTED TO BY R3
74                       ; AND PUT IT INTO R4
75                       ; CALLED VIA: JSR PC,UNDO
76
77 07602 011304 UNDO:    MOV     (R3),R4         ; GET ARGUMENT
78 07604 042704          BIC     #40000,R4       ; CLEAR VISIBILITY
         040000
79 07610 032704          BIT     #20000,R4       ; POS, OR NEG, ?
         020000
80 07614 001403          BEQ     UNDO0           ; POS,= BRANCH
81 07616 042704          BIC     #20000,R4       ; CLEAR SIGN BIT
         020000
82 07622 005404          NEG     R4              ; MAKE CORRECT
83 07624 000207 UNDO0:   RETURN                  ; AND EXIT
84                       .IFDF   $DISK
```



```
1                        .SBTTL  "TEXT" ROUTINE
2                        .ENDC
3                ;       ****************************************
4
5                        ; ROUTINE TO HANDLE:
6                        ;       CALL "TEXT"( <ARG, LIST>)
7                        ; WHERE:
8                        ;       +N: <CR> AND N <LF>
9                        ;        0:  <CR> AND NO <LF>
10                       ;       -N: SHIFT-OUT STRING FOLLOWS
11                       ;       R$ OR "STRING":  STRING DATA
12                       ;  IF SHIFT-OUT, ONLY RIGHTMOST 5 BITS
13                       ;  IF SHIFT-IN, IGNORE ALL NON-PRINTABLES
14
15 07626         TEXT:
16 07626 005067          CLR     SHIFT           ; DEFAULT TO SHIFT IN
         000326
17 07632 004767          JSR     PC,BUFPOL       ; ENTER POLISH, CK"("
         170346
18 07636 007640'                 ,+2             ; EXIT POLISH
19 07640 012700          MOV     #100000,R0      ; SET CHARACTER MODE
         100000
20 07644 004767          JSR     PC,PUTSGM       ; INSERT IT
         172074
21 07650 012702          MOV     #CBUFF,R2       ; R2 POINTS TO R0
         010162'
22 07654 000410          BR      TEXT1           ; GET FIRST ARG,
23 07656 122127 TEXT0:   CMPB    (R1)+,#,COMMA   ; DO WE HAVE A COMMA?
         000000G
24 07662 001405          BEQ     TEXT1           ; YES- GET ARG,
25 07664 124127          CMPB    -(R1),#,RPAR    ; NO- NO MORE ARGS?
         000000G
26 07670 001521          BEQ     TEXT11          ; YES- EXIT
27 07672 000167          JMP     ERRSYN          ; NO- ERROR
         000000G
28 07676 010046 TEXT1:   MOV     R0,-(SP)        ; SAVE CHAR, BUFFER
29 07700 010246          MOV     R2,-(SP)        ; AND PTR
30 07702 004767          JSR     PC,EVAL         ; GET ARG,
         000000G
31 07706 103427          BCS     TEXT2           ; BRANCH IF STRING
32 07710 004767          JSR     PC,ENTERP       ; IMMED, POLISH
         170242
33 07714 000006'                 +INTEGR         ; INTEGERIZE IT
34 07716 012602          MOV     (SP)+,R2        ; RESTORE PTR
35 07720 012600          MOV     (SP)+,R0        ; RESTORE BUFFER
36 07722 016503          MOV     FAC2(R5),R3     ; COUNT INTO R3
         000042
37 07726 002003          BGE     TEXT3           ; BRANCH IF CARRIAGE
38 07730 010667          MOV     SP,SHIFT        ; FLAG FOR SHIFT-OUT
         000224
39 07734 000750          BR      TEXT0           ; GET NEXT ARG,
40 07736 012704 TEXT3:   MOV     #15,R4          ; INSERT <CR>
         000015
41 07742 004767          JSR     PC,LDCHAR       ; INSERT IT
         000216
42 07746 012704          MOV     #12,R4          ; INSERT <LF>
         000012
```

```
43 07752 005703          TST     R3              ; ANY TO DO?
44 07754 001740 TEXT5:   BEQ     TEXT8           ; NO- EXIT
45 07756 004767          JSR     PC,LDCHAR       ; YES- INSERT IT
         000202
46 07762 005303          DEC     R3              ; DECREMENT COUNTER
47 07764 000773          BR      TEXT5           ; CONTINUE IN LOOP
48 07766 012603 TEXT2:   MOV     (SP)+,R3        ; GET PTR TO STRING
49 07770 012602          MOV     (SP)+,R2
50 07772 012600          MOV     (SP)+,R0        ; RESTORE BUFFER AND PTR
51 07774 020327          CMP     R3,#-1          ; NULL STRING?
         177777
52 10000 001437          BEQ     TEXT8           ; YES- CLEAR SHIFT IF SET
53 10002 010146          MOV     R1,-(SP)        ; SAVE R1
54 10004 111301          MOVB    (R3),R1         ; GET LENGTH OF STRING
55 10006 062703          ADD     #3,R3           ; POINT AT STRING
         000003
56 10012 005767          TST     SHIFT           ; SHIFT OUT?
         000142
57 10016 001434          BEQ     TEXT6           ; NO- BRANCH
58 10020 012704          MOV     #16,R4          ; SHIFT-OUT
         000016
59 10024 042704 TEXT7:   BIC     #177740,R4      ; CLEAR ALL BUT 5 LO-ORDER BITS
         177740
60 10030 020427          CMP     R4,#17          ; BETTER NOT BE SHIFT-IN
         000017
61 10034 001010          BNE     TEXT13          ; NO- CONTINUE
62 10036 004767          JSR     PC,LDCHAR       ; PUT IN SHIFT IN
         000122
63 10042 012704          MOV     #40,R4          ; AND SPACE
         000040
64 10046 004767          JSR     PC,LDCHAR       ; PUT IT IN
         000112
65 10052 012704          MOV     #16,R4          ; AND SHIFT OUT
         000016
66 10056 004767 TEXT13:  JSR     PC,LDCHAR       ; INSERT IT
         000102
67 10062 112304          MOVB    (R3)+,R4        ; LOAD UP NEXT BYTE
68 10064 005301          DEC     R1              ; DECREMENT LENGTH+1
69 10066 002356          BGE     TEXT7           ; STORE BYTE IF NOT AT END
70 10070 012704          MOV     #17,R4          ; INSERT SHIFT-IN
         000017
71 10074 004767          JSR     PC,LDCHAR       ; INSERT IT
         000064
72 10100 005067 TEXT8:   CLR     SHIFT           ; CLEAR SHIFT-OUT FLAG
         000054
73 10104 012601 TEXT10:  MOV     (SP)+,R1        ; RESTORE R1
74 10106 000663          BR      TEXT0           ; GET NEXT ARG,
75 10110 112304 TEXT6:   MOVB    (R3)+,R4        ; GET CHAR,
76 10112 001403          BEQ     TEXT9A          ; LET NULLS SLIP THROUGH
77 10114 120427          CMPB    R4,#40          ; PRINTABLE
         000040
78 10120 002402          BLT     TEXT9           ; NO- DON'T PRINT IT
79 10122 004767 TEXT9A:  JSR     PC,LDCHAR       ; YES- INSERT IT
         000036
80 10126 005301 TEXT9:   DEC     R1              ; DECREMENT BYTE COUNT
81 10130 001367          BNE     TEXT6           ; CONTINUE IF MORE LEFT
82 10132 000764          BR      TEXT10          ; RESTORE R1 AND GET NEXT ARG
```



```
83 10134 032702 TEXT11:  BIT     #1,R2           ; FILLED EVEN NO. OF BYTES?
         000001
84 10140 001403          BEQ     TEXT12          ; YES- BRANCH
85 10142 005004          CLR     R4              ; MAKE LAST BYTE = 0
86 10144 004767          JSR     PC,LDCHAR       ; LOAD UP DPY FILE WITH LAST WORD
         000014
87 10150 004767 TEXT12:  JSR     PC,INSERT       ; INSERT INTO FILE
         170570
88 10154 000167          JMP     CKRPAR          ; AND EXIT
         170136
89
90 10160 000000 SHIFT:   .WORD   0               ; SHIFT-OUT FLAG
91 10162 000000 CBUFF:   .WORD   0               ; CHARACTER BUFFER
92
93               ;       ***************************************
94               ; LOAD CHARACTER ROUTINE
95
96 10164 110422 LDCHAR:  MOVB    R4,(R2)+        ; PUT BYTE INTO R0
97 10166 032702          BIT     #1,R2           ; ODD OR EVEN BYTE NEXT?
         000001
98 10172 001005          BNE     LDCH0           ; ODD- DON'T INSERT YET
99 10174 016700          MOV     CBUFF,R0        ; LOAD UP DPY WORD
         177762
100 0200 004767          JSR     PC,PUTWD        ; EVEN- CAN INSERT NOW
         170444
101 0204 005742          TST     -(R2)           ; POINT BACK AT CBUFF
102 0206 000207 LDCH0:   RETURN                  ; RETURN TO CALLER
103                      .IFDF   $CLOCK
104                      .IFDF   $DISK
```

```
1                       ,SBTTL  "TIME" AND "TIMR" ROUTINES
2                       ,ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE:
6                       ;       CALL "TIME"(A)
7                       ; WHERE A IS THE NUMBER OF TICKS WANTED
8
9 010210        TIME:
10 10210 004767         JSR     PC,POLENT       ; ENTER POLISH, CK "("
         170054
11 10214 000136'                +GETONE         ; GET A
12 10216 000006'                +INTEGR         ; INTEGERIZE IT
13 10220 010222'                ,+2             ; EXIT FROM POLISH
14 10222 005767         TST     DSPTCH          ; GOT A CLOCK?
         000152
15 10226 001055         BNE     TIME2           ; NO- EXIT
16 10230 013746         MOV     @#4,-(SP)       ; SAVE LOC 4
         000004
17 10234 012737         MOV     #HERE,@#4       ; MAY ADR
         010366'
         000004
18 10242 005737         TST     @#177546        ; GOT ONE
         177546
19 10246 012637 TIMM:   MOV     (SP)+,@#4       ; RESTORE LOC 4
         000004
20 10252 005767         TST     DSPTCH          ; WELL
         000122
21 10256 001041         BNE     TIME2           ; NO CLOCK: EXIT
22 10260 016500         MOV     FAC2(R5),R0     ; GET COUNT IN TICKS
         000042
23 10264 003002         BGT     ,+6             ; CONTINUE IF POSITIVE
24 10266 000167         JMP     ERRARG          ; NO- ERROR IF <=0
         000000G
25 10272 010067         MOV     R0,TIMEC        ; SAVE TIME COUNT
         000156
26 10276 005067         CLR     TMSW            ; ASSUME NO ONE ELSE USING CLOCK
         000156
27 10302 012700         MOV     #100,R0         ; USE FOR LKV AND BIT 6
         000100
28 10306 030067         BIT     R0,LKS          ; CLOCK INTERRUPT ENABLED?
         177546'
29 10312 001414         BEQ     TIME0           ; NO- BRANCH
30 10314 021027         CMP     (R0),#TMR       ; MY OLD REQUEST?
         010402'
31 10320 001004         BNE     TIME1           ; NO- BRANCH
32 10322 005767         TST     TMRADR          ; ANY ADR FROM LAST TIME?
         000130
33 10326 001406         BEQ     TIME0           ; NO- BRANCH
34 10330 000402         BR      ,+6             ; YES- BRANCH
35 10332 011067 TIME1:  MOV     (R0),TMRADR     ; YES- GET LKV
         000120
36 10336 012767         MOV     #6,TMSW         ; SET UP PROPER EXIT
         000006
         000114
37 10344 012760 TIME0:  MOV     #300,2(R0)      ; PUT IN BR6
         000300
```



```
         000002
38 10352 012710         MOV     #TMR,(R0)       ; PUT ADR AT LKV
         010402'
39 10356 010067         MOV     R0,LKS          ; ENABLE CLOCK
         177546'
40 10362 000167 TIME2:  JMP     CKRPAR          ; CK ")" AND EXIT TO USER
         167730
41 10366 012716 HERE:   MOV     #TIMM,(SP)      ; RET ADR
         010246'
42 10372 010667         MOV     SP,DSPTCH       ; SIGNAL NO CLOCK
         000002
43 10376 000002         RTI
44 10400 000000 DSPTCH: ,WORD   0               ; NON-ZERO IF NO CLOCK
45
46 10402 005767 TMR:    TST     TIMEC           ; TIME ELAPSED YET?
         000046
47 10406 003410         BLE     TMR0            ; END OF LOOP?  BRANCH
48 10410 005367         DEC     TIMEC           ; DECREMENT THE COUNT
         000040
49 10414 005767         TST     TMSW            ; ANYBODY ELSE?
         000040
50 10420 001001         BNE     ,+4             ; YES
51 10422 000002         RTI                     ; NO- CONTINUE
52 10424 000177         JMP     @TMRADR         ; GO TO HIM
         000026
53 10430 066767 TMR0:   ADD     TMSW,PC         ; AND DISPATCH TO EXIT
         000024
54 10434 005067         CLR     LKS             ; CLEAR CLOCK STATUS REGISTER
         177546'
55 10440 000002         RTI
56 10442 016767         MOV     TMRADR,LKV      ; GIVE BACK VECTOR
         000010
         000100'
57 10450 000177         JMP     @LKV            ; AND CONTINUE THERE
         000100'
58
59 10454 000000 TIMEC:  ,WORD   0               ; NUMBER OF TICKS
60 10456 000000 TMRADR: ,WORD   0               ; OLD CONTENTS OF LKV
61 10460 000000 TMSW:   ,WORD   0               ; ENDING TYPE ( 0 OR 6)
62
63
64              ;       ****************************************
65
66                      ; ROUTINE TO HANDLE:
67                      ;       CALL "TIMR"(E)
68                      ; RETURNS THE CURRENT VALUE OF TIMER IN E
69
70 10462 004767 TIMR:   JSR     PC,POLENT       ; ENTER POLISH, CK"("
         167602
71 10466 010470'                ,+2             ; EXIT POLISH
72 10470 004767         JSR     PC,GETADR       ; GET ADR OF E IN R2
         171342
73 10474 005022         CLR     (R2)+           ; ZERO HI-ORDER WORD
74 10476 016722         MOV     TIMEC,(R2)+     ; SAVE CURRENT # OF TICKS
         177752
75 10502 000167         JMP     CKRPAR          ; CK ")" AND EXIT TO USER
         167610
```

```
76                      .ENDC
77                      .IFDF   $DISK
```



```
1                 .SBTTL  DISPLAY FILE BEGINING
2                 .ENDC
3                 ;       ************************************
4
5                         ; THIS PORTION MUST BE LINKED BOTH TO THE RT-11
6                         ; SCROLL BUFFER (IF THERE IS ONE) AND THE REST OF THE
7                         ; USER'S DISPLAY FILE.
8
9  010506         BEG:
10 10506 160000           DJMP                    ; THE START
11 10510 010576'                  +RSTFIL         ; REST OF FILE IF TRAK OFF
12 10512 010520'                  +TAG2           ; ADR FOR TRAK SUBP
13 10514 177777 TAG1:     -1                      ; TAG FOR TRAK ROUTINE
14 10516 000000           .WORD 0                 ; NEXT TAG POINTER
15 10520 170200 TAG2:.    .WORD   170200          ; LD, STATUS REG, A
16 10522 117124           .WORD   117124          ; APNT, I=4, T=0
17 10524 000000 XT:       .WORD   0               ; X POSITION
18 10526 000000 YT:       .WORD   0               ; Y POSITION OF TRAK
19 10530 104140           .WORD   104140  ; SHORT VECTOR LP ENABLE
20 10532 057600           .WORD    57600
21 10534 077677           .WORD    77677
22 10536 040177           .WORD    40177
23 10540 040177           .WORD    40177
24 10542 077677           .WORD    77677
25 10544 057600           .WORD    57600
26 10546 040077           .WORD    40077
27 10550 077777           .WORD    77777
28 10552 057777           .WORD    57777
29 10554 057677           .WORD    57677
30 10556 074000           .WORD    74000
31 10560 040017           .WORD    40017
32 10562 067400           .WORD    67400
33 10564 040136           .WORD    40136
34 10566 047400           .WORD    47400
35 10570 040017           .WORD    40017
36 10572 173400           .WORD   $DINT    ; END OF TRAK SUBPICTURE
37 10574 000000           .WORD    0
38 10576 117124 RSTFIL:   .WORD   117124          ; APNT L=OFF,I=4, F=OFF, T=0
39 10600 000000           .WORD   0,0             ;       AT (0,0)
   10602 000000
40 10604 170240           .WORD   170240          ; LD STAT REG A, NORMAL FONT, LP INT
41 10606 160000           DJMP                    ; DJMP TO START OF FILE
42 10610 010506'DSTOP:    .WORD   BEG             ; INITIALLY TO TRAK OBJ
43
44 10612 000000 DCRASH:   .WORD   0               ; LAST WORD IN DPY FILE (EXCLUDING TEXT)
45       000001'          .END
```

SYMBOL TABLE

```
ABS.F   003640RG        ACTEND  000640RG        ACTST   000642RG
ADBAS   001334R         ADRARG  002240R         ADRCHK  006404R
ADRCH0  006432R         ADRCH1  006424R         ADRCH2  006430R
ADRCH3  006456R         ADRSYN  002244R         ADSTK   001362RG
AGET    006666RG        AGETF   006752R         AGETX   006744R
AGETY   007004R         AGET0   006710R         AGET1   007010R
AGET2   006772R         AGET3   006704R         AGET4   007036R
APNT    004120RG        APUT    006462RG        APUTF   006576R
APUTF0  006634R         APUTX   006552R         APUTY   006564R
APUT1   006530R         APUT2   006646R         ARGGET  001766R
ARRAYS= 000010          BEG     010506RG        BITGET  003214R
BITNEG  003230R         BITZER  003234R         BUFPOL  000204R
BUFTST  000210RG        BUFT0   000226R         CBUFF   010162R
CKEOL   000324RG        CKLPAR  000276R         CKLSYN  000306R
CKOPCM  001702R         CKOPC0  001734R         CKOSYN  001740R
CKRPAR  000316R         CKRPA0  000334R         CONT    002450RG
CONTA   002454RG        CONT0   002470R         DCRASH  010612RG
DFOERR  000664R         DISEND  000636RG        DISINT  000466R
DISX  = ****** G        DISY  = ****** G        DIS0    000506R
DIVVEC  004504R         DJMP  = 160000          DPC   = ****** G
DSPTCH  010400R         DSR   = ****** G        DSTOP   010610RG
DSTP    002360RG        ELOOP   000040R         ELOOP0  000052R
ENTERP  000156R         ERA8    001456RG        ERA80   001502R
ERAS1   001522R         ERAS2   001526R         ERAS3   001572R
ERAS4   001576R         ERAS5   001554R         ERRAOR  004534R
ERRARG= ****** G        ERRDIV  004442R         ERRSYN= ****** G
ERSS3   002226R         ERSTAR  004434R         ESUB    001250RG
ESXIT   001330R         EVAL  = ****** G        FAC1  = 000040
FAC2  = 000042          FIGARG  007322R         FIGR    007042RG
FIGRLP  007216R         FIGR1   007254R         FIGR2   007302R
FIGSYN  007326R         FIX     003032RG        FIXSP = ****** G
FIX0  = ****** G        FLOAT = ****** G        FPPRES  000442R
FPPSAV  000416R         FPUT    007332RG        FPUT0   007402R
FPUT1   007446R         FPUT2   007462R         FPUT3   007524R
FPUT4   007574R         FPUT5   007562R         FX      006374R
FXL     006400R         FY      006364R         FYL     006370R
GETADR  002036R         GETAD0  002234R         GETAD1  002250R
GETAD2  002332R         GETAD3  002336R         GETAD5  002344R
GETAD6  002310R         GETAD7  002310R         GETARG  000152R
GETNUM  000076R         GETONE  000136R         GETOUT  000332R
GETSAV  002026R         GETSYN  000146R         GETVAR= ****** G
GRAARG  005372R         GRALP   005576R         GRALP1  005606R
GRASYN  005366R         GRA.0   005156R         GRA.1   005232R
GRA.3   005242R         GRA0    005300R         GRA1    005302R
GRA10   005504R         GRA2    005314R         GRA3    005376R
GRA4    005630R         GRA5    005642R         GRA6    005472R
GRA7    005514R         GRA7A   005532R         GRA9    005550R
GTVECT= ****** G        HERE    010366R         HIFREE= 000012
IFX     006354R         IFY     006344R         INIT    002500RG
INITA   002504RG        INIT1   002616R         INIT2   002606R
INIT3   002670R         INSERT  000744R         INSRTF  000634RG
INSXIT  001004R         INT   = ****** G        INTEGR  000006R
INTEG0  000022R         INVIS   003236R         LCLOOP  002162R
LDCHAR  010164R         LDCH0   010206R         LIFT    003050R
LIFT0   003126R         LIFT1   003174R         LIFT2   003152R
LKS   = 177546          LKV   = 000100          LLX     006360R
LLY     006350R         LOCNO2  002210R         LOFREE= 000014
```


SYMBOL TABLE

```
LOOPCT  000054R         LPADR   000056R         LPEN    001602RG
LPENT   001666R         LPENX   001670R         LPENY   001674R
LPEN.F  001700R         LPEN0   001622R         LPEX1   003620R
LPINT0  003272R         LPINT1  003310R         LPINT2  003412R
LPINT3  003524R         LPINT4  003554R         LPINT5  003570R
LPNINT  003240R         LPS.F   005574R         MODE    005674R
MSG   = ****** G        MULVEC  006234R         M1      004642R
M2      004644R         NARRAY= ****** G        NEGSTK  000176R
NEWPUT  000644R         NOSC    002714RG        NSBAS   001364R
NSTERR  001146R         NSTSK   001412RG        NUMOUT= ****** G
OFF     003024RG        OLDMOD  001764RG        ON      002724RG
ON0     002750R         ON1     002730R         ON2     003016R
ON3     003012R         OPARGF  000074R         OPTSTR  006316R
OPTST0  006342R         PC    =%000007          PLOOP   000026R
POLENT  000270R         POLRET= 000134          POP     000256R
POSX    004514R         POSY    004522R         POS0    004526R
POS1    004532R         PR4   = 000200          PR7   = 000340
PSHPTR  006212R         PSHXIT  004640R         PSW   = 177776
PUSH    000234R         PUSHF   004574R         PUSH1   000246R
PUTSGM  001744R         PUTS0   001762R         PUTWD   000650R
PUT1    000724R         PUT2    000732R         PUT3    000714R
PUT5    000652R         PUT6    000700R         PUT7    000672R
QIKPOL  000312R         RDOT    003732RG        RDOT0   004066R
RDOT1   004024R         RELABS  004456R         RELAB0  004466R
RESTR   002472R         RETURN= 000207          RETURP  000166R
REVRSE  004546R         RSTFIL  010576R         RUN.F   002446R
R0    =%000000          R0SAVE= 000044          R1    =%000001
R2    =%000002          R3    =%000003          R4    =%000004
R5    =%000005          SAVER0  001452R         SAVER1  004542R
SAVINT  000000R         SCAL    005700RG        SCALEX  004770R
SCALEY  005042R         SCAL.F  002712R         SCAL0   006200R
SCLGEN  006244R         SCLSAV  006314R         SCL.X   006402RG
SCL.Y   006372RG        SCPTR   006210R         SCUSC0  004360R
SCUSC1  004432R         SC.USC  004320RG        SDINT = 173400
SDXIT   004200R         SDXIT0  004204R         SDXIT1  005660R
SETNEC  000060R         SETOPT  000066R         SHIFT   010160R
SKPARG  000340R         SKPA0   000412R         SKPA1   000366R
SKPA2   000400R         SKPA3   000344R         SKPA4   000356R
SP    =%000006          SS1SAV= 000024          SS2SAV= 000026
SS2TMP  005676R         STAT    003642RG        STOPA   002364RG
STOP8   002436R         STOPC   002420R         STOP.F  002444R
STOVAR= ****** G        SUBP    001006RG        SUBP0   001040R
SUBP1   001034R         SUBP2   001154R         SUBP3   001174R
SUB0    000552R         SUB1    000544R         SUB2    000572R
TABLE = ****** G        TAGEND  001436RG        TAGMED  001434R
TAGSRH  001414RG        TAGXIT  001432R         TAG1    010514RG
TAG2    010520R         TEN24   006224R         TEXT    007626RG
TEXT0   007656R         TEXT1   007676R         TEXT10  010104R
TEXT11  010134R         TEXT12  010150R         TEXT13  010056R
TEXT2   007766R         TEXT3   007736R         TEXT5   007754R
TEXT6   010110R         TEXT7   010024R         TEXT8   010100R
TEXT9   010126R         TEXT9A  010122R         TGLOOP  001420R
TIME    010210RG        TIMEC   010454R         TIME0   010344R
TIME1   010332R         TIME2   010362R         TIMM    010246R
TIMR    010462RG        TMR     010402R         TMRADR  010456R
TMR0    010430R         TMSW    010460R         TRAK    004646RG
TRAKX   004764R         TRAKY   004766R         TST64   001440R
```

```
GTB  V01-01 BASIC - GT ROOT MOD RT-11 MACRO VM02-09   16-OCT-74 02:06:07 PAGE 48+
SYMBOL TABLE

T0      006736R         T1      006544R         UNDO    007602R
UNDO0   007624R         USCL.X  006362R         USCL.Y  006352R
USRARE= ****** G        VARSAV= 000022          VECT    004214RG
VECT0   004252R         WD1     000740RG        WD2     000742RG
XGRA    005124RG        XSCL0   005022R         XSCL1   005040R
XSCL2   005016R         XSIGN   002032R         XT      010524R
XYBIG   002030R         YGRA    005142RG        YSCL0   005072R
YSCL1   005110R         YSCL2   005122R         YSIGN   002034R
YT      010526R         ZERNUM  000124R         $ADC  = 000000
$ADR  = ****** G        $CLK  = 000000          $CLOCK= 000000
$DEPTH= 000012          $DIO  = 000000          $DIS  = 000000
$DVR  = ****** G        $ERVEC= ****** G        $IR   = ****** G
$LPS  = 000000          $MLR  = ****** G        $SBR  = ****** G
$STRNG= 000000          $VT11 = 000000          .COMMA= ****** G
.EOL  = ****** G        .LPAR = ****** G        .RPAR = ****** G

. ABS.  000000     000
        010614     001
ERRORS DETECTED: 0
FREE CORE: 17006. WORDS

.LP:=PERPAR,GTL,GTB1,GTB2,GTB3,GTB4
```

```
PERPAR -- PERIPHERAL SUPPORT PA RT-11 MACRO VM02-09   16-OCT-74 02:14:36 PAGE 1

1                ;TITLE PERPAR -- PERIPHERAL SUPPORT PACKAGE PARAMETER MODULE.
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25
26               ; THE CONDITIONALS CONTAINED IN THIS MODULE AFFECT THE ASSEMBLY
27               ; OF THE FUNCTION TABLE MODULE "FTBL.MAC".
28               ; TO OBTAIN THE DESIRED CONDITIONAL DEFINITION(S),
29               ; REMOVE (USING AN EDITOR) THE
30               ; SEMI-COLON APPEARING BEFORE THE CONDITIONAL.
31               ;$DISK=0                ;DEFINE FOR RT-11
32                       .IFNDF $DISK
33       000000 $STRNG=0                 ;DO NOT DEFINE FOR PTS BASIC WITHOUT
34                                       ;$TRINGS,= DEFINED FOR PTS V01 WITH STRINGS
35                       .ENDC           ;
36
37       000000 $LPS=0                   ;DEFINE FOR LPS
38                       .IFDF $LPS
39               ;$V=0                   ;DEFINE FOR LPS WITH VECTORS STARTING
40               ;                       ;     AT 300.  DEFAULT SETTING IS VECTORS AT
41               ;                       ;     340. SET $V = ANY OTHER DISPLACEMENT IF
42               ;                       ;        VECTORS START AT DISPLACEMENTS
43               ;                       ;        OTHER THAN 0 OR 40 FROM
44               ;                       ;        VECTOR 300
45
46       000000 $ADC=0                   ;INCLUDE A/D ROUTINES.
47       000000 $CLK=0                   ;INCLUDE CLOCK ROUTINES.
48       000000 $DIO=0                   ;INCLUDE DIGITAL IO ROUTINES
49       000000 $DIS=0                   ;INCLUDE DISPLAY ROUTINES.
50                       .ENDC   ;$LPS
51               ;
52               ;
53       000000 $VT11=0                  ;FOR GT40 (GT44)
54               ;
55               ;
56
57
```

90

```
                        .IFDF   $VT11
000000 $CLOCK=0                         ;FOR SYSTEM CLOCK (KW11L)
                        .ENDC

                        .EOT
                .TITLE  GTC  V01-01  BASIC - GT  DISK OVERLAY MODULE

                ;
                ;       DEC-11-LBPGC-A-LA       BASIC KERNEL V02-01
                ;
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                ;
                ;       AUTHOR: DR. STEPHEN R. ALPERT   AUGUST 1973
                        .IFDF   $DISK
                        .SBTTL  GLOBALS,EQUATES
                        .ENDC


                ;       REGISTER ASSIGNMENTS
000000          R0=%0
000001          R1=%1
000002          R2=%2
000003          R3=%3
000004          R4=%4
000005          R5=%5
000006          SP=%6
000007          PC=%7

                ;       GLOBALS TO COMMUNICATE WITH ROOT SECTION
                        .GLOBL  SAVE,FIXSP,FIX0,FREE,BUFTST
                        .IFDF   $DISK
                        .MCALL  .DSTATUS,.LOCK,.UNLOCK,.CLOSE,.LOOKUP,.SRESET
                        .MCALL  .ENTER,.READW,.WRITW,.FETCH,.CSISPC
                        .GLOBL  RSTR,FREEGET,FREE0
                        .GLOBL  SAV24,SAVERT
                        .ENDC
                        .IFNDF  $VTONLY
                        .GLOBL  RTSON,NARRAY,TABLE
                        .ENDC
                        .IFDF   $DISK
                        .GLOBL  IGNORE          ; FROM BASICR
                        .ENDC
```



```
                        .GLOBL  MSG,,LPAR,,RPAR,,EOL,ERRSYN
                        .GLOBL  NUMOUT,ERRARG,CKEOL
                        .GLOBL  NSTSK,ESUB,INSRTF,STOPA,TAG1,ACTST
                        .GLOBL  ACTEND,BEG,WD1,WD2,DSTOP,OLDMOD
                        .GLOBL  DISEND,CONTA,TAGEND,ADSTK,DCRASH,WD1,WD2
                        .GLOBL  CONT

                ;       EQUATES
000207          RETURN  = 207           ; RTS PC
177776          PSW     =-2             ; PROCESSOR STATUS WORD
160000          DJMP    = 160000        ; A DISPLAY JUMP
173400          SDINT   = 173400        ; A STOP DISPLAY AND INTERRUPT

                ;       EQUATES FROM BASIC
000040          FAC1=   40
000042          FAC2=   42
000010          ARRAYS= 10
000012          HIFREE= 12
000014          LOFREE= 14
000074          HISTR=  74
000072          LOSTR=  72
000004          PDL=    4
000076          BUFCHN= 76
                        .IFDF   $DISK
```

```
                        .SBTTL  "SAVE" ROUTINE
                        .ENDC
                ;       ****************************************

                        ; ROUTINE TO HANDLE:
                        ;       CALL "SAVE" [( <FILE DESCRIPTOR> )]

                        ; MUST HAVE EXTRA WORD BEFORE START OF EACH SUBPICTURE
                        ; REGISTER USAGE:
                        ;       R0 = "GET" WORD POINTER
                        ;       R1 = ADR STACK POINTER (INITIALLY #ADSTK)
                        ;       R2,R3 = FAST STORAGE
                        ;       R4 = "PUT" WORD POINTER
                        ;       R5 = BACKWARD POILTER FOR TAG LINKED LIST

000000          SAVE:
000000 010146           MOV     R1,-(SP)        ; SAVE R1
000002 010546           MOV     R5,-(SP)        ; SAVE R5
000004 005777 SAVE0:    TST     #NSTSK          ; CURRENTLY BUILDING A SUBPICTURE?
       000000G
000010 001403           BEQ     SAV0            ; NO- BRANCH
                        .IFDF   $CRASH
                        TRAP    0
                        .ASCII  /STILL IN SUBPICTURE/
                        .BYTE   0
                        .EVEN
                        .ENDC                   ; $CRASH
                        .IFNDF  $CRASH
000012 004767           JSR     PC,ESUB         ; PUT IN AN EXIT
       000000G
000016 000772           BR      SAVE0           ; TEST IF ENOUGH
                        .ENDC
000020 005767 SAV0:     TST     INSRTF          ; INSERT PENDING?
       000000G
000024 001375           BNE     SAV0            ; YES- LOOP UNTIL FREE
                ;  INITIALIZE
000026 004767           JSR     PC,STOPA        ; STOP THE DISPLAY
       000000G
000032 012700           MOV     #TAG1+2,R0      ; GET PTR TO 1-ST SUBP
       000002G
000036 010005           MOV     R0,R5           ; SAVE FOR LATER USE
000040 011000 SAV1:     MOV     (R0),R0         ; GET POINTER
000042 001405           BEQ     SAV2            ; BRANCH IF ALL SUBP DONE
000044 014002           MOV     -(R0),R2        ; GET ADR OF SUBP
000046 010203           MOV     R2,R3           ; PUT ADR IN R3 ALSO
000050 010243           MOV     R2,-(R3)        ; PUT ADR OF SUBP BEFORE SUBP
000052 022020           CMP     (R0)+,(R0)+     ; MOVE R0 TO NEXT TAG
000054 000771           BR      SAV1            ; AND LOOP
                ;  SET UP FOR COMPRESSION OF DPY FILE
000056 005015 SAV2:     CLR     (R5)            ; ZERO WORD FOR TAG SEARCH
000060 016700           MOV     ACTST,R0        ; "GET" PTR
       000000G
000064 010004           MOV     R0,R4           ; "PUT" PTR
000066 010546           MOV     R5,-(SP)        ; WRITE ENABLE
000070 012701           MOV     #ADSTK,R1       ; REST OF FILE ADR STACK
       000000G
000074 020067 SAV3:     CMP     R0,DISEND       ; DONE YET?
```



```
       000000G
000100 103154           BHIS    SAV5            ; YES- BRANCH
000102 012003           MOV     (R0)+,R3        ; GET WORD
000104 100407           BMI     SAV4            ; DPU INST,- BRANCH
000106 012746 SAVCON:   MOV     #SAV3,-(SP)     ; FAKE A JSR PC
       000074'
000112 005766 SAVSET:   TST     2(SP)           ; WRITE ENABLED?
       000002
000116 001401           BEQ     .+4             ; NO- BRANCH
000120 010324           MOV     R3,(R4)+        ; YES- PUT WORD
000122 000207           RETURN                  ; EXIT
                ;  PROCESS DPU INSTRUCTION (SOME OF THEM)
000124 020327 SAV4:     CMP     R3,#DJMP        ; A DISPLAY JUMP?
       160000
000130 001406           BEQ     SAV6            ; YES- BRANCH
000132 020327           CMP     R3,#DJMP+1      ; A JUMP FROM SUBP (OFF)?
       160001
000136 001403           BEQ     SAV6            ; YES- CONTINUE
000140 020327           CMP     R3,#SDINT       ; A STOP DISPLAY?
       173400
000144 001077           BNE     SAV7            ; NO- BRANCH
                ;  HERE IF SDINT OR DJMP
000146 005720 SAV6:     TST     (R0)+           ; NEXT WORD ZERO?
000150 001467           BEQ     SAV8            ; YES- (SDINT/0 CASE)- BRANCH
000152 021060           CMP     (R0),6(R0)      ; ACTIVE SUBP FOLLOWS?
       000006
000156 001023           BNE     SAV9            ; NO- BRANCH
000160 005716           TST     (SP)            ; WRITE ENABLED?
000162 001002           BNE     SAV10           ; YES- BRANCH
000164 012703           MOV     #DJMP,R3        ; CHANGE SDINT TO DJMP
       160000
000170 010546 SAV10:    MOV     R5,-(SP)        ; WRITE ENABLE
000172 010324           MOV     R3,(R4)+        ; INSERT SDINT OR DJMP
000174 010441           MOV     R4,-(R1)        ; SAVE PTR TO "REST OF FILE ADR"
000176 022024           CMP     (R0)+,(R4)+     ; R0 TO TAG, R4 TO SUBP ADR
                ;  INSERT ADR OF SUBP IF FOLLOWING
000200 010414           MOV     R4,(R4)         ; OFFSET FOR NEW ADDRESS
000202 062724           ADD     #10,(R4)+       ; ADD TO POINT TO CORRECT WORD
       000010
000206 011014 SAV18:    MOV     (R0),(R4)       ; MOVE TAG
000210 022020           CMP     (R0)+,(R0)+     ; POINT "GET" AT SUBP-2
000212 010415 SAV11:    MOV     R4,(R5)         ; SET NEW LINK IN TAG CHAIN
000214 005724           TST     (R4)+           ; POINT TO "NEXT TAG PTR"
000216 010405           MOV     R4,R5           ; SAVE NEW BACK PTR
000220 005024           CLR     (R4)+           ; ZERO PTR TO STOP SEARCH
000222 012024           MOV     (R0)+,(R4)+     ; MOVE ADDRESS BEFORE SUBP
000224 000723           BR      SAV3            ; AND CONTINUE
                ;  HERE IF AN ACTIVE SUBPICTURE DOESN'T FOLLOW SDINT OR DJMP
000226 005716 SAV9:     TST     (SP)            ; WRITE ENABLE?
000230 001003           BNE     SAV12           ; YES- BRANCH
000232 062700 SAV14:    ADD     #6,R0           ; MOVE R0
       000006
000236 000716           BR      SAV3            ; AND CONTINUE
000240 020327 SAV12:    CMP     R3,#DJMP        ; A DISPLAY JUMP?
       160000
000244 001004           BNE     SAV13           ; NO- BRANCH
000246 021000           CMP     (R0),R0         ; SUBP FOLLOWS?
```

```
97 00250 103770          BLO     SAV14           ; NO= BRANCH
98 00252 005046          CLR     -(SP)           ; YES= DISABLE WRITE
99 00254 000766          BR      SAV14           ; AND CONTINUE
100                ; HERE IF SDINT/ SUBP BACK
101 0256 010324 SAV13:   MOV     R3,(R4)+        ; SET SDINT
102 0260 010414          MOV     R4,(R4)         ; PUT IN CURRENT POSITION
103 0262 062724          ADD     #10,(R4)+       ; OFFSET FOR ADDRESS
         000010
104 0266 012014          MOV     (R0)+,(R4)      ; MOVE OLD SUBP ADR
105 0270 012702          MOV     #TAG1,R2        ; GET ADR OF 1=ST POINTER
         000000G
106 0274 016202 SAV15:   MOV     2(R2),R2        ; GET ADR
         000002
107 0300 001406          BEQ     SAV16           ; BRANCH IF NOT ACTIVE
108 0302 014203          MOV     -(R2),R3        ; GET NEW SUBP ADR
109 0304 026314          CMP     -2(R3),(R4)     ; A MATCH?
         177776
110 0310 001405          BEQ     SAV17           ; YES= FOUND SUBP= BRANCH
111 0312 005722          TST     (R2)+           ; POINT R2 AT NEXT PTR
112 0314 000767          BR      SAV15           ; NO= LOOP
113                ; HERE IF SDINT/ WENABL/ SUBP NOT ACTIVE
114 0316 024444 SAV16:   CMP     -(R4),-(R4)     ; POINT TO SDINT
115 0320 005726          TST     (SP)+           ; CLEAN STK AND ADR=STK
116 0322 000743          BR      SAV14           ; AND CONTINUE
117                ; !!! I DON'T THINK THAT SAV16 WILL BE REACHED
118                ; HERE IF FOUND SUBP
119 0324 010324 SAV17:   MOV     R3,(R4)+        ; SET NEW ADR
120 0326 000727          BR      SAV18           ; SET TAG AND CONTINUE
121                ; HERE IF SDINT/0 CASE
122 0330 005726 SAV8:    TST     (SP)+           ; WRITE ENABLED?
123 0332 001660          BEQ     SAV3            ; NO= CONTINUE
124 0334 010324          MOV     R3,(R4)+        ; INSERT SDINT
125 0336 005024          CLR     (R4)+           ; FOLLOWED BY ZERO
126 0340 010431          MOV     R4,@(R1)+       ; FIX ADR OF REST OF FILE
127 0342 000654          BR      SAV3            ; AND CONTINUE
128                ; HERE IF DPU INST, NOT SDINT OR DJMP
129 0344 010302 SAV7:    MOV     R3,R2           ; GET WORD
130 0346 042702          BIC     #3777,R2        ; LEAVE BITS 15-11
         003777
131 0352 020227          CMP     R2,#110000      ; LONG VECTOR?
         110000
132 0356 001421          BEQ     SAV19           ; YES= BRANCH
133 0360 020227          CMP     R2,#120000      ; XGRA?
         120000
134 0364 103650          BLO     SAVCON          ; NO= BRANCH
135 0366 020227          CMP     R2,#124000      ; YGRA?
         124000
136 0372 101245          BHI     SAVCON          ; NO= BRANCH
137                ; HERE IF XGRA OR YGRA
138 0374 005720          TST     (R0)+           ; ADD TWO TO R0
139 0376 022020 SAV23A:  CMP     (R0)+,(R0)+     ; ADD 4 TO R0
140 0400 012003 SAV23:   MOV     (R0)+,R3        ; GET ADR OF SS1
141 0402 012023          MOV     (R0)+,(R3)+     ; STORE SS1 IN SYMTAB
142                      .IFNDF  $VTONLY
143 0404 002003          BGE     .+10
144 0406 005343          DEC     -(R3)
145 0410 005413          NEG     (R3)
```



```
146 0412 006223          ASR     (R3)+
147                      .ENDC
148 0414 012713          MOV     #-1,(R3)        ; RESTORE SS2
         177777
149 0420 000625          BR      SAV3            ; AND CONTINUE
150                ; HERE IF LONG VECTOR (MAYBE FIGR)
151 0422 021027 SAV19:   CMP     (R0),#DJMP      ; NEXT WORD DJMP FOR FIGR
         160000
152 0426 001227          BNE     SAVCON          ; NO= SAVE WORD AND CONTINUE
153 0430 000762          BR      SAV23A          ; AND CONTINUE
154                ; HERE IF ALL DONE!
155 0432 005726 SAV5:    TST     (SP)+           ; CLEAN OFF OLD WRITE FLAG
156 0434 010467          MOV     R4,DISEND       ; SET NEW DISEND
         000000G
157 0440 012024          MOV     (R0)+,(R4)+     ; PUT IN OLD DJMP
158 0442 010467          MOV     R4,ACTEND       ; SET NEW ACTEND
         000000G
159 0446 012024          MOV     (R0)+,(R4)+     ; PUT IN RETURN ADDRESS
160 0450 012605          MOV     (SP)+,R5        ; RESTORE R5
161 0452 012601          MOV     (SP)+,R1        ; RESTORE R1
162 0454 016702          MOV     ACTST,R2        ; GET START OF DPY FILE
         000000G
163 0460 010204          MOV     R2,R4           ; SAVE IN R4 ALSO
164 0462 016703          MOV     TAG1+2,R3       ; GET ADR OF FIRST SUBP TAG
         000002G
165 0466 010342          MOV     R3,-(R2)        ; PUT BEFORE DPY FILE
166 0470 001425          BEQ     SAV21           ; NO SUBP= BRANCH
167 0472 004767          JSR     PC,ADRSET       ; OFFSET ADR
         000036
168 0476 010302 SAV20:   MOV     R3,R2           ; GET NEXT POINTER
169 0500 001421          BEQ     SAV21           ; NO MORE= BRANCH
170 0502 024242          CMP     -(R2),-(R2)     ; POINT AT REST OF FILE ADR
171 0504 004767          JSR     PC,ADRSET       ; OFFSET ADR
         000024
172 0510 011200          MOV     (R2),R0         ; GET ADR OF SUBP
173 0512 005060          CLR     -2(R0)          ; CLEAR WORD BEFORE SUBP
         177776
174 0516 160400          SUB     R4,R0           ; MAKE OFFSET ADR
175 0520 010022          MOV     R0,(R2)+        ; STORE ADR
176 0522 005722          TST     (R2)+           ; BUMP BY TAG
177 0524 011203          MOV     (R2),R3         ; GET ADR OF NEXT TAG
178 0526 001406          BEQ     SAV21           ; NO MORE= BRANCH
179 0530 012746          MOV     #SAV20,-(SP)    ; FAKE JSR PC
         000476'
180 0534 011200 ADRSET:  MOV     (R2),R0         ; GET ADR
181 0536 160400          SUB     R4,R0           ; SUBTRACT ACTST
182 0540 010022          MOV     R0,(R2)+        ; SAVE OFFSET ADR
183 0542 000207          RETURN
184 0544 010400 SAV21:   MOV     R4,R0           ; ACTST IN R0
185 0546 005740          TST     -(R0)           ; MOVE ONE WORD BACK
186 0550 016740          MOV     ACTEND,-(R0)    ; PUT END IN PRECEDING WORD
         000000G
187 0554 160410          SUB     R4,(R0)         ; MINUS LO END
188 0556 006210          ASR     (R0)            ; CONVERT TO WORDS
189 0560 005210          INC     (R0)            ; GET CORRECT NO OF WORDS
190                ; ************************
191                      .IFDF   $DISK
```

```
192                     CMPB    (R1)+,#,LPAR    ; LEFT PAREN?
193                     BEQ     SAV22           ; YES- DO FILE I/O
194                     DEC     R1              ; POINT AT TOKEN
195                     MOV     R1,R1SVE        ; SAVE R1
196                     JMP     SAV29           ; YES- FINISH UP
197             SAV22:  MOV     R0,WD1          ; SAVE START ADR OF BUFFER
198                     MOV     (R0),R0         ; GET WORD COUNT MINUS 2
199                     ADD     #2,R0           ; MAKE = N
200                     MOV     R0,WD2          ; SAVE WORD COUNT
201                     CLR     -(SP)           ; SIGNIFY WRITE OPERATION
202                     JMP     SAVERT          ; IN ROOT SECTION
203             ;!!!!!!!SAVERT IS IN ROOT SO OVERLAY WORKS
204             SAV24:  MOV     (SP)+,R0        ; POINTER TO STRING
205                     MOV     R1,R1SVE        ; SAVE R1 FOR EXIT
206                     CLR     R1
207                     BISB    (R0)+,R1        ; GET LENGTH
208                     ADD     #2,R0           ; START OF ASCII STRING
209                     ADD     R1,R0           ; POINT AT END +1
210                     CLRB    (R0)            ; FOLLOWED BY 0 BYTE
211                     MOV     R0,-(SP)        ; SAVE PTR TO END
212                     SUB     R1,R0           ; POINT AT BEGINNING
213                     .CSISPC #FILE,#DEFEXT,R0
214                     BCC     .+6             ; NO= ERROR
215                     JMP     ERRARG          ; ELSE ERROR
216                     TST     (SP)+           ; BETTER NOT HAVE SWTICHES
217                     BNE     .-6             ; YES= ERROR
218                     MOVB    R1,@(SP)+       ; RESTORE BYTE COUNT
219                     MOV     #FILE+30.,R0    ; ADR OF RAD 50 NAME
220                     MOV     R0,R2           ; SAVE IN R2
221                     .DSTATUS        #DSTAT  ; R0 ==> DEV;
222                     BCS     DERR0           ; INVALID DEVICE
223                     MOV     #DSTAT+2,R0     ; POINT AT DEVBLK+1 WORD
224                     MOV     (R0)+,R3        ; GET HANDLER LENGTH
225                     TST     (R0)            ; HANDLER LOADED?
226                     BNE     SAV24A          ; YES= BRANCH
227                     MOV     R3,R0           ; GET ITS LENGTH
228                     JSR     PC,FREEGET      ; ASK FOR ROOM
229                     BCS     SAV41           ; NOT ENOUGH AVAILABLE
230                     MOV     R0,-(SP)        ; SAVE R0 ADR OF HANDLER
231                     MOV     R2,R0           ; R0 ==> DEV;
232                     EMT     343             ; FETCH HANDLER
233                     BCS     DERR0           ; BAD FETCH
234             SAV24A: TST     (SP)+           ; READ OR WRITE?
235                     BEQ     SAV40           ; WRITE= BRANCH
236                     JMP     RSTR1           ; READ= BRANCH
237             SAV41:  JSR     R1,MSG
238                     .BYTE   15,12
239                     .ASCII  /?NER=C/
240                     .BYTE   15,12,0
241                     .EVEN
242                     JMP     SAV28           ; FINISH UP
243             SAV40:  .LOCK                   ; LOCK USR IN CORE
244                     TST     DSTAT           ; FILE DEVICE?
245                     BPL     DERR0           ; NO= BRANCH
246                     .CLOSE  7               ; YES= CLOSE CHANNEL 7
247                     .LOOKUP 7,R2            ; LOOKUP THE FILE
248                     BCS     SAV25           ; NOT FOUND= BRANCH
```



```
249                     .UNLOCK                 ; RELEASE THE USR
250                     JSR     R1,MSG          ; ASK IF REPLACE
251                     .ASCII  /FILE ALREADY EXISTS/
252                     .BYTE   0
253                     .EVEN
254                     .CLOSE  7               ; NO= CLOSE CHANNEL 7
255                     .UNLOCK                 ; UNLOCK USR
256             SAV31:  BR      SAV28           ; RESTORE FILE AFTER CKING ")"
257             SAV25:  BIT     #40000,DSTAT    ; READ ONLY DEVICE?
258                     BEQ     SAV26           ; NO= BRANCH
259             DERR0:  JSR     PC,DERR         ; TELL NEWS
260                     BR      SAV31           ; AND FINISH
261             DERR:   .CLOSE  7               ; CLOSE CHANNEL 7
262                     .UNLOCK                 ; UNLOCK USR
263                     JSR     R1,MSG          ; TELL USER NEWS
264                     .BYTE   15,12           ; CR-LF
265                     .ASCII  /?DEV ERR - C/
266                     .BYTE   15,12,0
267                     .EVEN
268                     RETURN                  ; RETURN TO CALLER
269             SAV26:  .ENTER  7,R2            ; ENTER THE FILE
270                     CLR     R0              ; BLOCK ZERO
271                     .WRITW  7,WD1,WD2       ; WRITE OUT DATA
272                     BCS     DERR0           ; ERROR= EXIT THRU MESSAGE
273             SAV27:  .CLOSE  7               ; RELEASE CHANNEL 7
274                     .UNLOCK                 ; RELEASE USR
275                     JSR     R1,MSG
276                     .ASCII  /**SAVE COMPLETED**/
277                     .BYTE 15,12,0
278                     .EVEN
279                     BR      SAV31           ; FIX STACK
280             SAV28:  .ENDC
281                     ;  ************************
282 0562 016704 SAV29:  MOV     ACTST,R4        ; GET START ADR
         000000G
283 0566 012700         MOV     #TAG1+2,R0      ; ADR OF PTR TO FIRST TAG
         000002G
284 0572 011002 SAV30:  MOV     (R0),R2         ; GET ADR OF TAG
285 0574 001415         BEQ     SAV32           ; NO MORE SUBP= BRANCH
286 0576 024242         CMP     -(R2),-(R2)     ; POINT AT ADR OF REST OF FILE
287 0600 060422         ADD     R4,(R2)+        ; UPDATE ADR
288 0602 060422         ADD     R4,(R2)+        ; UPDATE ADR OF SUBP
289 0604 012246         MOV     (R2)+,-(SP)     ; PUT TAG ON STK= ZERO?
290 0606 005712         TST     (R2)            ; ADR OF NEXT TAG ZERO?
291 0610 001401         BEQ     .+4             ; YES= BRANCH
292 0612 060412         ADD     R4,(R2)         ; UPDATE TAG PTR
293 0614 005726         TST     (SP)+           ; WAS TAG ZERO?
294 0616 001002         BNE     .+6             ; NO= BRANCH
295 0620 011210         MOV     (R2),(R0)       ; YES= ELIMINATE LINK
296 0622 001763         BEQ     SAV30           ; LOOP
297 0624 010200         MOV     R2,R0           ; UPDATE PTR R0
298 0626 000761         BR      SAV30           ; LOOP
299 0630 010067 SAV32:  MOV     R0,TAGEND       ; STORE ADR TO LAST TAG+2
         000000G
300                     .IFDF   $DISK
301                     MOV     R1SVE,R1        ; RESTORE R1
302                     .ENDC
```

```
303 0634 000167          JMP     $DXIT           ; EXIT
         001152
304                      .IFDF   $DISK
305              R1SVE:  .WORD   0               ; SAVE R1 HERE
306              DSTAT:  .=.+8.                  ; DEVBLK
307              DEFEXT: .RAD50  'DPY'
308                      .WORD   0,0,0
309              FILE:   .=.+78.                 ; 39 WORD BLOCK
310                      .IFDF   $DISK
```



```
1                        .SBTTL  "RESTORE" ROUTINE
2                        .ENDC
3                ;       ****************************************
4
5                        ; ROUTINE TO HANDLE:
6                        ;       CALL "RSTR"( <FILE DESCRIPTOR> )
7
8                RSTR:
9                        JSR     PC,BUFTST       ; ANY BUFFER?
10                       JSR     PC,STOPA        ; STOP THE DISPLAY
11                       CMPB    (R1)+,#,LPAR    ; A "(" ?
12                       BEQ     RSTR0           ; YES- BRANCH
13                       JMP     ERRSYN          ; NO- ERROR
14               RSTR0:  MOV     R1,-(SP)        ; SIGNAL READ OPERATION
15                       TST     INSRTF          ; INSERT PENDING?
16                       BNE     .-4             ; YES- LOOP TIL FREE
17                       JMP     $AVERT          ; GET NAME IN ROOT
18               RSTR1:  .LOOKUP 7,R2            ; LOOKUP THE FILE ON CHANNEL 7
19                       BCC     RSTR2           ; BRANCH IF FOUND
20                       .CLOSE  7               ; CLOSE CHANNEL 7
21                       .UNLOCK                 ; UNLOCK THE USR
22                       JSR     R1,MSG
23                       .BYTE   15,12
24                       .ASCII  /SAVE FILE NOT FOUND/
25                       .BYTE   15,12,0
26                       .EVEN
27               RSTR4:  MOV     R1SVE,R1        ; RESTORE R1
28                       JMP     $DXIT
29               RSTR2:  BIT     #20000,DSTAT    ; WRITE ONLY DEVICE?
30                       BEQ     RSTR3           ; NO- CONTINUE
31               RDERR:  JSR     PC,DERR         ; DEVICE ERROR
32                       BR      RSTR4           ; AND EXIT
33               RSTR3:  .READW  7,#WDD1,#2,#0   ; READ ON 7- 2 WORDS
34                       MOV     #ACTEND,-(SP)   ; SAVE END ADR
35                       MOV     DISEND,R4       ; GET CURRENT LO
36                       MOV     DCRASH,R0       ; HI END
37                       SUB     R4,R0           ; GET SIZE
38                       ASR     R0              ; CONVERT TO WORDS
39                       INC     R0              ; SIZE IN WORDS AVAILABLE
40                       CMP     WDD1,R0         ; ENOUGH ROOM?
41                       BLE     RSTR5           ; YES- BRANCH
42                       .CLOSE  7               ; CLOSE CHANNEL 7
43                       .UNLOCK                 ; RELEASE THE USR
44                       JSR     R1,MSG
45                       .BYTE   15,12
46                       .ASCII  /NOT ENOUGH DISPLAY BUFFER FOR RESTORE/
47                       .BYTE   15,12,0
48                       .EVEN
49                       TST     (SP)+           ; CLEAN STK
50                       BR      RSTR4           ; AND EXIT
51               ;  GET REST OF DATA
52               RSTR5:  MOV     (SP)+,R5        ; SAVE END ADDRESS
53                       CLR     R0              ; BLOCK 0
54                       CLR     -(SP)           ; CLEAR STK FOR READW
55                       MOV     WDD1,-(SP)      ; REST OF DATA
56                       ADD     #2,(SP)         ; ACTUAL END
57                       MOV     -(R4),R3        ; SAVE IN R3
```

```
58                      MOV     -(R4),R2        ; SAVE IN R2
59                      MOV     R4,-(SP)        ; ADR TO PUT DATA
60                      EMT     200+7           ; READ IT IN
61                      BCC     .+4             ; ALL OKAY- BRANCH
62                      BR      RDERR           ; NOT OKAY- BRANCH
63                      MOV     R2,(R4)+        ; RESTORE IT
64                      MOV     R3,(R4)+        ; RESTORE IT
65                      .CLOSE  7               ; CLOSE CHANNEL 7
66                      .UNLOCK                 ; UNLOCK USR
67              ;  STRAIGHTEN OUT FILE
68                      MOV     #DD1,R3         ; GET WORD COUNT
69                      ASL     R3              ; CONVERT TO BYTES
70                      ADD     R4,R3           ; POINT AT END
71                      MOV     R5,-(R3)        ; SAVE ADR OF RETURN
72                      TST     #NSTSK          ; IN A SUBP NOW?
73                      BNE     .+6             ; YES- DON'T UPDATE ACTEND
74                      MOV     R3,ACTEND
75                      MOV     #DJMP,-(R3)     ; SHOULDN'T BE NECESSARY
76                      MOV     R3,DISEND       ; NEW DISEND
77                      TST     #DD2            ; ANY SUBP IN NEW FILE?
78                      BEQ     RSTR4           ; NO- EXIT
79                      MOV     #DD2,R0         ; GET OFFSET OF FIRST TAG
80                      ADD     R4,R0           ; MAKE AN ADDRESS
81                      MOV     R0,@TAGEND      ; LINK UP TAG CHAIN
82                      MOV     TAGEND,R0       ; FIX R0 PTR
83                      JMP     $AV30           ; AND FINISH UP
84                      .ENDC
85                      .IFDF   $DISK
```



```
1                       .SBTTL  "FIX" AND "FREE" ROUTINES
2                       .ENDC
3               ;       ****************************************
4
5                       ; ROUTINE TO HANDLE:
6                       ;       CALL "FIX"(N), OR
7                       ;       IMPLICITLY ASK FOR HALF FREE SPACE
8
9  000640       FIX0:                           ; IMPLICIT ENTRY POINT
10 00640 010667         MOV     SP,IMP,F        ; SIGNAL IMPLICIT ENTRY
         001064
11 00644 005000         CLR     R0              ; SIGNAL WANT HALF
12 00646 000422         BR      FIX1            ; BRANCH
13 00650             FIXSP:                     ; ENTRY FROM FIX IN ROOT SECTION
14 00650 005067         CLR     IMP,F           ; CLEAR IMPLICIT ENTRY FLAG
         001054
15 00654 122127         CMPB    (R1)+,#.RPAR    ; A ")" ?
         000000G
16 00660 001402         BEQ     .+6             ; YES- BRANCH
17 00662 000167         JMP     ERRSYN          ; NO- SYNTAX ERROR
         000000G
18 00666 016500         MOV     FAC2(R5),R0     ; GET N
         000042
19 00672 003002         BGT     .+6             ; POSITIVE BRANCH
20 00674 000167 FIXARG: JMP     ERRARG          ; ERROR N <= 0
         000000G
21 00700 005767         TST     DCRASH          ; SPACE ALREADY ALLOCATED?
         000000G
22 00704 001001         BNE     FIX2            ; YES- BRANCH
23 00706 005200         INC     R0              ; NO ASK FOR
24                      .IFDF   $DISK           ; 1 OR 2 MORE WORDS
25                      INC     R0
26                      .ENDC
27 00710 006300 FIX2:   ASL     R0              ; CONVERT TO BYTES
28 00712 103770         BCS     FIXARG          ; TOO MANY- ERROR
29              ; FIND AVAILABLE SPACE
30 00714 026565 FIX1:   CMP     LOSTR(R5),HISTR(R5)
         000072
         000074
31 00722 001476         BEQ     FIX3            ; STRINGS ARE LOW
32 00724 010146         MOV     R1,-(SP)
33 00726 010246         MOV     R2,-(SP)        ; DO DNPACK HERE
34 00730 010346         MOV     R3,-(SP)
35 00732 005046         CLR     -(SP)           ; MAKE ROOM
36 00734 016502         MOV     LOSTR(R5),R2
         000072
37 00740 016501         MOV     LOFREE(R5),R1
         000014
38 00744 010165         MOV     R1,LOSTR(R5)
         000072
39 00750 005016 DNPLOOP:        CLR     (SP)
40 00752 152216         BISB    (R2)+,(SP)
41 00754 001012         BNE     DNPZRO
42 00756 020265 DNPBAD: CMP     R2,HISTR(R5)
         000074
43 00762 103772         BLO     DNPLOOP
44 00764 010165         MOV     R1,HISTR(R5)    ; SAVE HI STRING ADDRESS
```

```
                000074
45 00770 005726         TST     (SP)+
46 00772 012603         MOV     (SP)+,R3
47 00774 012602         MOV     (SP)+,R2
48 00776 012601         MOV     (SP)+,R1
49 01000 000447         BR      FIX3
50 01002 005003 DNPZRO: CLR     R3
51 01004 152203         BISB    (R2)+,R3
52 01006 000303         SWAB    R3
53 01010 152203         BISB    (R2)+,R3
54 01012 061602         ADD     (SP),R2
55 01014 005202         INC     R2
56 01016 030327         BIT     R3,#1
                000001
57 01022 001402         BEQ     .+6
58 01024 005303         DEC     R3
59 01026 061503         ADD     (R5),R3
60 01030 020365         CMP     R3,PDL(R5)      ; 4 = PDL
                000004
61 01034 103350         BHIS    DNPBAD
62 01036 020306         CMP     R3,SP
63 01040 103013         BHIS    DNPGOOD
64 01042 020365         CMP     R3,ARRAY$(R5)
                000010
65 01046 101343         BHI     DNPBAD
66 01050 020365         CMP     R3,HIFREE(R5)
                000012
67 01054 101005         BHI     DNPGOOD
68 01056 020365         CMP     R3,LOFREE(R5)
                000014
69 01062 103335         BHIS    DNPBAD
70 01064 020315         CMP     R3,(R5)
71 01066 103733         BLO     DNPBAD
72 01070 062716 DNPGOOD: ADD    #4,(SP)
                000004
73 01074 161602         SUB     (SP),R2
74 01076 020213         CMP     R2,(R3)
75 01100 001005         BNE     DNPIGNO
76 01102 010113         MOV     R1,(R3)
77 01104 112221         MOVB    (R2)+,(R1)+
78 01106 005316         DEC     (SP)
79 01110 003375         BGT     .-4
80 01112 000721         BR      DNPBAD
81 01114 061602 DNPIGNO:        ADD     (SP),R2
82 01116 000717         BR      DNPBAD
83 01120 016504 FIX3:   MOV     HIFREE(R5),R4   ; GET HIFREE PTR
                000012
84 01124 010446         MOV     R4,-(SP)        ; SAVE IT
85 01126 166516         SUB     HISTR(R5),(SP)  ; FREE BYTES
                000074
86 01132 062716         ADD     #2,(SP)         ; ACTUAL
                000002
87 01136 016767         MOV     DCRASH,WDD2     ; SAVE DCRASH
                000000G
                000570
88 01144 001405         BEQ     FIX3A           ; NO BUFFER= BRANCH
89 01146 166567         SUB     ARRAY$(R5),WDD2 ; SUBTRACT BOTTOM END
```



```
                000010
                000560
90 01154 066716         ADD     WDD2,(SP)       ; GET TOTAL FREE
                000554
91 01160 005700 FIX3A:  TST     R0              ; HAVE WD COUNT?
92 01162 001034         BNE     FIX5            ; YES= BRANCH
93 01164 011600         MOV     (SP),R0         ; GET MAX SPACE FREE
94 01166 006200         ASR     R0              ; DIVIDE BY 2
95 01170 006200         ASR     R0              ; CONVERT TO WORDS
96 01172 010046         MOV     R0,-(SP)        ; SAVE R0
97 01174 005300         DEC     R0
98                      .IFDF   $DISK
99                      DEC     R0              ; TWO WORDS FOR DISK VERSION
100                     .ENDC
101 1176 010065         MOV     R0,FAC2(R5)     ; PUT INTO OUTPUT BUFFER
                000042
102 1202 005065         CLR     FAC1(R5)
                000040
103 1206 004767         JSR     PC,NUMOUT       ; TELL USER
                000000G
104 1212 004167         JSR     R1,MSG
                000000G
105 1216    040         .ASCII  / WORDS FOR DISPLAY FILE/
    1217    127
    1220    117
    1221    122
    1222    104
    1223    123
    1224    040
    1225    106
    1226    117
    1227    122
    1230    040
    1231    104
    1232    111
    1233    123
    1234    120
    1235    114
    1236    101
    1237    131
    1240    040
    1241    106
    1242    111
    1243    114
    1244    105
106 1245    015         .BYTE   15,12,0
    1246    012
    1247    000
107                     .EVEN
108 1250 012600         MOV     (SP)+,R0        ; RESTORE R0
109 1252 006300         ASL     R0              ; BACK TO BYTES
110             ; SHIFT ARRAYS
111 1254 004767 FIX5:   JSR     PC,STOPA        ; STOP DISPLAY
                000000G
112 1260 016703         MOV     DCRASH,R3       ; GET HI END
                000000G
113 1264 010367         MOV     R3,WDD1         ; SAVE OLD DCRASH
```

97

```
                000442
114 1270 001004         BNE     .+12            ; BRANCH IF CALLED BEFORE
115 1272 016567         MOV     ARRAYS(R5),DCRASH       ; NEW DCRASH
                000010
                000000G
116 1300 000412         BR      FIX6            ; CONTINUE
117 1302 016702         MOV     ACTST,R2        ; GET LO END
                000000G
118 1306 160203         SUB     R2,R3           ; GET LENGTH OF CURRENT BUFFER
119 1310 062703         ADD     #2,R3           ; IN BYTES
                000002
120 1314 160300         SUB     R3,R0           ; SHIFT FACTOR
121                                             ; >0: NEED MORE// <0: FREE UP
122 1316 001003         BNE     FIX6            ; MUST CHANGE- BRANCH
123 1320 005726         TST     (SP)+           ; NO CHANGE- CLEAN STK
124 1322 000167         JMP     FIXXIT          ; AND EXIT
                000364
125 1326 016503 FIX6:   MOV     ARRAYS(R5),R3   ; GET TOP END
                000010
126 1332 005700         TST     R0
127 1334 002002         BGE     .+6             ; CONTINUE IF >= 0
128 1336 005726         TST     (SP)+           ; CLEAN STK
129 1340 000442         BR      FIX7            ; BRANCH
130 1342 166716         SUB     WDD2,(SP)       ; BACK TO FREE BELOW HIFREE
                000366
131 1346 020026         CMP     R0,(SP)+        ; ENOUGH ROOM?
132 1350 101421         BLOS    FIX25           ; YES- BRANCH
133 1352 016767 FIXERR: MOV     WDD1,DCRASH     ; RESTORE OLD DCRASH
                000354
                000000G
134 1360 104400         TRAP    0
135 1362    116         .ASCII  /NER - FOR DISPLAY BUFFER/
    1363    105
    1364    122
    1365    040
    1366    055
    1367    040
    1370    106
    1371    117
    1372    122
    1373    040
    1374    104
    1375    111
    1376    123
    1377    120
    1400    114
    1401    101
    1402    131
    1403    040
    1404    102
    1405    125
    1406    106
    1407    106
    1410    105
    1411    122
136 1412    000         .BYTE   0
137                     .EVEN
```



```
138 1414 004767 FIX25:  JSR     PC,PRIOR        ; FIX LEVEL AND LPS JUNK
                000402
139 1420 010402         MOV     R4,R2           ; GET ARRAY PTR
140 1422 160002         SUB     R0,R2           ; NEW ARRAY PTR
141 1424 010246         MOV     R2,-(SP)        ; SAVE ON STK
142 1426 022224         CMP     (R2)+,(R4)+     ; POINT AT CORRECT WORDS
143 1430 020403         CMP     R4,R3           ; DONE?
144 1432 101002         BHI     .+6             ; YES- BRANCH
145 1434 012422         MOV     (R4)+,(R2)+     ; MOVE WORD
146 1436 000774         BR      .-6             ; LOOP
147 1440 005742         TST     -(R2)           ; NEW ARRAYS
148 1442 010246         MOV     R2,-(SP)        ; SAVE ON STK
149 1444 000414         BR      FIX8            ; BRANCH
150                 ; SHIFT UP
151 1446 004767 FIX7:   JSR     PC,PRIOR        ; FIX LEVEL AND LPS JUNK
                000350
152 1452 010302         MOV     R3,R2           ; GET ARRAYS
153 1454 160002         SUB     R0,R2           ; NEW ARRAYS
154 1456 005046         CLR     -(SP)
155 1460 010246         MOV     R2,-(SP)        ; SAVE ON STK
156 1462 022223         CMP     (R2)+,(R3)+     ; FOR AUTO- DECREMENT
157 1464 014342         MOV     -(R3),-(R2)     ; MOVE WORD
158 1466 020304         CMP     R3,R4           ; DONE?
159 1470 101375         BHI     .-4             ; NO- LOOP
160 1472 010266         MOV     R2,2(SP)        ; SAVE NEW ARRAY PTR
                000002
161                 ; FIX SYMTAB
162 1476 011503 FIX8:   MOV     (R5),R3         ; START OF TABLE
163 1500 020365 FIXSRH: CMP     R3,LOFREE(R5)   ; END?
                000014
164 1504 103070         BHIS    FIX9            ; YES- BRANCH
165 1506 021327         CMP     (R3),#-3        ; ENTRY OR LINE NO, ?
                177775
166 1512 103011         BHIS    FIX12           ; ENTRY BRANCH
167 1514 022323 FIX17:  CMP     (R3)+,(R3)+     ; GO PAST LIN NO,
168 1516 000770         BR      FIXSRH          ; LOOP
169 1520 022327 FIX10:  CMP     (R3)+,#-2       ; AN ARRAY?
                177776
170 1524 001001         BNE     FIX11           ; NO- BRANCH
171 1526 160013         SUB     R0,(R3)         ; NEW ADR OF ARRAY
172 1530 062703 FIX11:  ADD     #10,R3          ; NEXT ENTRY
                000010
173 1534 000761         BR      FIXSRH          ; LOOP
174 1536 021327 FIX12:  CMP     (R3),#-1        ; A STRING?
                177777
175 1542 001366         BNE     FIX10           ; NO- KEEP GOING
176 1544 005723         TST     (R3)+           ; YES- BUMP R3
177 1546 010046         MOV     R0,-(SP)        ; SAVE OFFSET
178 1550 012300         MOV     (R3)+,R0        ; ADR OF START OF STRING
179 1552 012302         MOV     (R3)+,R2        ; GET SS1
180 1554 100442         BMI     FIX13           ; NO- SS- BRANCH
181 1556 011304         MOV     (R3),R4         ; GET SS2
182 1560 100420         BMI     FIX14           ; 1 DIMENSIONAL- BRANCH
183 1562 005204         INC     R4              ; MAKE SS2+1
184 1564 010246         MOV     R2,-(SP)
185 1566 010446         MOV     R4,-(SP)        ; SAVE HERE TOO
186 1570 012746         MOV     #20,-(SP)       ; 16 BITS
```

```
        000020
187 1574 006304 FIXLP:  ASL     R4              ; SS2*2
188 1576 006366         ASL     2(SP)
        000002
189 1602 103002         BCC     .+6
190 1604 066604         ADD     4(SP),R4
        000004
191 1610 005316         DEC     (SP)
192 1612 003370         BGT     FIXLP           ; FORM SS2*SS2
193 1614 062706         ADD     #6,SP           ; TIDY  STK
        000006
194 1620 060402         ADD     R4,R2           ; ADD SS1
195 1622 005202 FIX14:  INC     R2              ; SS1+1
196 1624 006302         ASL     R2              ; WORDS TO BYTES
197 1626 060002         ADD     R0,R2           ; HI ADR OF STRING LIST
198                 ; FIX STRINGS
199 1630 020002 FIX15:  CMP     R0,R2           ; DONE?
200 1632 101013         BHI     FIX13           ; DONE LOOP
201 1634 022027         CMP     (R0)+,#-1       ; A NULL STRING ?
        177777
202 1640 001773         BEQ     FIX15           ; YES- LOOP
203 1642 014004         MOV     -(R0),R4        ; ADR OF STR
204 1644 005204         INC     R4              ; POINT AT FIRST BYTE OF PTR
205 1646 000300         SWAB    R0
206 1650 110024         MOVB    R0,(R4)+
207 1652 000300         SWAB    R0              ; RESTORE R0
208 1654 110024         MOVB    R0,(R4)+        ; SET IN SECOND BYTE
209 1656 005720 FIX16:  TST     (R0)+           ; ADD 2 TO ARRAY ADR
210 1660 000763         BR      FIX15
211 1662 012600 FIX13:  MOV     (SP)+,R0        ; RESTORE OFFSET
212 1664 000713         BR      FIX17
213                 ; FIX BUFFER CHAIN
214 1666        FIX9:
215                     .IFDF   $DISK
216                     .SRESET                 ; GIVE BACK ALL DEVICE HANDLERS
217                     MOV     R5,R2           ; GET PTR TO BASE OF USER AREA
218                     ADD     #BUFCHN,R2      ; OFFSET TO BUFFER CHAIN POINTER
219                 FIX9B: TST  (R2)            ; ANY BUFFERS?
220                     BEQ     FIX9A           ; NO- BRANCH
221                     SUB     R0,(R2)         ; YES- CORRECT POINTER
222                     MOV     (R2),R2         ; POINT R2 AT NEXT BUFFER
223                     BR      FIX9B           ; CHECK IT
224                 FIX9A:
225                     .ENDC
226 1666 011665         MOV     (SP),ARRAYS(R5) ; NEW PTR
        000010
227 1672 012602         MOV     (SP)+,R2        ; KEEP TO DETERMINE ACTST
228 1674 012665         MOV     (SP)+,HIFREE(R5) ; NEW PTR
        000012
229 1700 022222         CMP     (R2)+,(R2)+     ; NEW START
230                     .IFDF   $DISK
231                     TST     (R2)+
232                     .ENDC
233 1702 010267         MOV     R2,ACTST        ; START OF FILE
        000000G
234 1706 012667         MOV     (SP)+,PSW       ; RESTORE PSW
        177776'
```



```
235 1712 012767 FIXXIT: MOV     #-1,DISEND      ; FOR AUTO INIT
        177777
        000000G
236 1720 005767         TST     IMP,F           ; CALLED BY INIT?
        000004
237 1724 001434         BEQ     $DXIT1          ; NO- EXIT
238 1726 000207         RETURN                  ; GO BACK TO INIT
239
240 1730 000000 IMP,F:  .WORD   0
241 1732 000000 WDD1:   .WORD   0
242 1734 000000 WDD2:   .WORD   0
```

```
1                       ;       ************************************
2
3                               ;  ROUTINE TO HANDLE:
4                               ;       CALL "FREE"
5
6                               .IFNDF  $DISK
7  001736               FREE:
8                               .ENDC
9                               .IFDF   $DISK
10                      FREE0:
11                              .ENDC
12 01736 004767                 JSR     PC,STOPA        ; STOP DISPLAY
         000000G
13 01742 012767                 MOV     #-1,DISEND      ; FOR AUTO INIT
         177777
         000000G
14 01750 012767                 MOV     #BEG,DSTOP      ; LOOP DISPLAY
         000000G
         000000G
15 01756 016700                 MOV     DCRASH,R0       ; GET HI END
         000000G
16 01762 001415                 BEQ     $DXIT1          ; NOTHING THERE- EXIT
17 01764 005067                 CLR     DCRASH          ; CLEAR DCRASH
         000000G
18 01770 016503                 MOV     ARRAYS(R5),R3   ;
         000010
19 01774 160300                 SUB     R3,R0           ; TO GIVE IT ALL BACK
20 01776 005400                 NEG     R0
21 02000 016504                 MOV     HIFREE(R5),R4   ; SET UP REGISTERS
         000012
22 02004 005067                 CLR     IMP,F           ; FOR EXIT
         177720
23 02010 000616                 BR      FIX7            ; SHIFT IT
24 02012 000167 $DXIT:          JMP     CONT            ; START DISPLAY AND EXIT
         000000G
25 02016 000167 $DXIT1:         JMP     CKEOL           ; CHECK EOL AND EXIT
         000000G
26
27                              .IFDF   $DISK
```



```
1                               .$BTTL  PRIORITY CHANGE AND LPS CLEAN-UP
2                               .ENDC
3                       ;       ****************************************
4
5  002022               PRIOR:
6                               .IFNDF  $VTONLY
7  002022 105767                TSTB    RTSON
         000000G
8  002026 001375                BNE     .-4             ; LOOP 'TIL NO DMA IN PROGRESS
9                               .ENDC
10 02030 011646                 MOV     (SP),-(SP)      ; MOVE DOWN RETURN ADR
11 02032 016766                 MOV     PSW,2(SP)       ; SAVE CURRENT PSW
         177776'
         000002
12 02040 052767                 BIS     #340,PSW        ; SET SELF AT LEVEL 7
         000340
         177776'
13                              .IFNDF  $VTONLY
14 02046 010146                 MOV     R1,-(SP)        ; SAVE R1
15 02050 012746                 MOV     #NARRAY,-(SP)
         000000G
16 02054 001415                 BEQ     PRIOR0          ; THERE IS NO LPS!!
17 02056 012701                 MOV     #TABLE,R1       ; GET START OF LPS ARRAY TABLE
         000000G
18 02062 005771 PRIOR1:         TST     @(R1)           ; ANY ENTRIES?
         000000
19 02066 001410                 BEQ     PRIOR0          ; NONE- EXIT
20 02070 060031                 ADD     R0,@(R1)+       ; ADJUST BEG PTR
21 02072 060031                 ADD     R0,@(R1)+       ; ADJUST END PTR
22 02074 060031                 ADD     R0,@(R1)+       ; ADJUST PUT PTR
23 02076 060031                 ADD     R0,@(R1)+       ; ADJUST GET PTR
24 02100 062701                 ADD     #4,R1           ; POINT AT NEXT TABLE ENTRY
         000004
25 02104 005316                 DEC     (SP)            ; MORE LPS ARRAYS?
26 02106 003365                 BGT     PRIOR1          ; YES- LOOP
27 02110 005726 PRIOR0:         TST     (SP)+           ; NO- CLEAN STK
28 02112 012601                 MOV     (SP)+,R1
29                              .ENDC
30 02114 000207                 RETURN
31
32       000001'                .END
```

```
GTC  V01-01  BASIC - GT  DISK 0 RT-11 MACRO VM02-09   16-OCT-74 02:14:36 PAGE 6+
SYMBOL TABLE

ACTEND= ****** G        ACTST = ****** G        ADRSET  000534R
ADSTK = ****** G        ARRAYS= 000010          BEG   = ****** G
BUFCHN= 000076          BUFTST= ****** G        CKEOL = ****** G
CONT  = ****** G        CONTA = ****** G        DCRASH= ****** G
DISEND= ****** G        DJMP  = 160000          DNPBAD  000756R
DNPGOO  001070R         DNPIGN  001114R         DNPLOO  000750R
DNPZRO  001002R         DSTOP = ****** G        ERRARG= ****** G
ERRSYN= ****** G        ESUB  = ****** G        FAC1  = 000040
FAC2  = 000042          FIXARG  000674R         FIXERR  001352R
FIXLP   001574R         FIXSP   000650RG        FIXSRH  001500R
FIXXIT  001712R         FIX0    000640RG        FIX1    000714R
FIX10   001520R         FIX11   001530R         FIX12   001536R
FIX13   001662R         FIX14   001622R         FIX15   001630R
FIX16   001656R         FIX17   001514R         FIX2    000710R
FIX25   001414R         FIX3    001120R         FIX3A   001160R
FIX5    001254R         FIX6    001326R         FIX7    001446R
FIX8    001476R         FIX9    001666R         FREE    001736RG
HIFREE= 000012          HISTR = 000074          IMP,F   001730R
INSRTF= ****** G        LOFREE= 000014          LOSTR = 000072
MSG   = ****** G        NARRAY= ****** G        NSTSK = ****** G
NUMOUT= ****** G        OLDMOD= ****** G        PC    =%000007
PDL   = 000004          PRIOR   002022R         PRIOR0  002110R
PRIOR1  002062R         PSW   = 177776          RETURN= 000207
RTSON = ****** G        R0    =%000000          R1    =%000001
R2    =%000002          R3    =%000003          R4    =%000004
R5    =%000005          SAVCON  000106R         SAVE    000000RG
SAVE0   000004R         SAVSET  000112R         SAV0    000020R
SAV1    000040R         SAV10   000170R         SAV11   000212R
SAV12   000240R         SAV13   000256R         SAV14   000232R
SAV15   000274R         SAV16   000316R         SAV17   000324R
SAV18   000206R         SAV19   000422R         SAV2    000056R
SAV20   000476R         SAV21   000544R         SAV23   000400R
SAV23A  000376R         SAV29   000562R         SAV3    000074R
SAV30   000572R         SAV32   000630R         SAV4    000124R
SAV5    000432R         SAV6    000146R         SAV7    000344R
SAV8    000330R         SAV9    000226R         SDINT = 173400
SDXIT   002012R         SDXIT1  002016R         SP    =%000006
STOPA = ****** G        TABLE = ****** G        TAGEND= ****** G
TAG1  = ****** G        WDD1    001732R         WDD2    001734R
WD1   = ****** G        WD2   = ****** G        $ADC  = 000000
$CLK  = 000000          $CLOCK= 000000          $DIO  = 000000
$DIS  = 000000          $LPS  = 000000          $STRNG= 000000
$VT11 = 000000          .EOL  = ****** G        .LPAR = ****** G
.RPAR = ****** G
. ABS.  000000     000
        002116     001
ERRORS DETECTED: 0
FREE CORE: 17950. WORDS

.LP:=PERPAR,GTL,GTC
```

```
GTNLPS V01-01  ;DUMMY LPS ENTRY RT-11 MACRO VM02-09   16-OCT-74 02:17:24 PAGE 1


1                .TITLE GTNLPS V01-01  ;DUMMY LPS ENTRY POINTS FOR THE GT PKG.
2                ;
3                ; COPYRIGHT (C) 1974
4                ;
5                ; DIGITAL EQUIPMENT CORPORATION
6                ; MAYNARD, MASSACHUSETTS 01754
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19               ;
20               ; DEC ASSUMES NO RESPONSIBILITY FOR THE USE
21               ; OR RELIABILITY OF ITS SOFTWARE ON EQUIPMENT
22               ; WHICH IS NOT SUPPLIED BY DEC.
23               ;
24                       .GLOBL  TABLE,FLOAT,NARRAY,RTSON
25
26       000000          NARRAY=0
27 00000         TABLE:
28 00000         FLOAT:
29 00000         RTSON:
30 00000 000000          .WORD   0
31       000001'         .END
```

```
GTNLPS V01-01  ;DUMMY LPS ENTRY RT-11 MACRO VM02-09   16-OCT-74 02:17:24 PAGE 1
SYMBOL TABLE

FLOAT   000000RG        NARRAY= 000000 G        RTSON   000000RG
TABLE   000000RG
. ABS.  000000      000
        000002      001
ERRORS DETECTED: 0
FREE CORE: 18561. WORDS

,LP:=GTNLPS
```

```
RT-11 LINK    V03-01    LOAD MAP
BGTLPS,SAV              16-OCT-74

SECTION ADDR    SIZE    ENTRY   ADDR    ENTRY   ADDR    ENTRY   ADDR

. ABS.  000000  000400  LIMIT   000002  PDL     000004  NARRAY  000005
                        POSIZE  000006  ARRAYS  000010  COLUMN  000034
                        FAC1    000040  FAC2    000042  T1      000056
                        T2      000060  T3      000062  RND1    000064
                        RND2    000066  FILLCO  000110  $STKSZ  000200
                        ,EOL    000201  ,RPAR   000237  ,COMMA  000243
                        ,LPAR   000255  GTVECT  000320  LPSIVA  000340
                        LPSIP   000342  CKLIVA  000344  CKLIP   000346
                        DRSIVA  000350  DRSIP   000352  START   001102
                        ARGB    010262  ERRARG  010312  BOMB    010320
                        EVAL    011402  TABLES  011562  TBLSEN  011626
                        ERRPDL  011772  OPRATO  012166  ERRSYN  012544
                        SOPRAT  012720  ERRMIX  013012  STPRO   013162
                        GETVAR  015364  INT     015574  MAKEST  017252
                        MSG     017452  NORM    017532  NUMOUT  017724
                        NUMSGN  017736  SAVCHA  020570  STOVAR  021254
                        VAL     023354  LPSAD   170400  LPSADB  170402
                        LPSCKS  170404  LPSPB   170406  LPSDR   170410
                        LPSDRS  170410  LPSDIB  170412  LPSDOR  170414
                        LPDISS  170416  LPDISX  170420  LPDISY  170422
                        LPSDMA  170436  DPC     172000  DSR     172002
                        DISX    172004  DISY    172006  TKS     177560
                        TPB     177566
        000400  024100
        024500  004276  IFPMP   024500  ERRFPU  024502  $SBR    024502
                        $ADR    024506  ALOG    025242  AINT    025616
                        $INTR   025634  $DVR    025734  EXP     026366
                        $IR     026736  $MLR    027022  $POPR5  027374
                        $POPR4  027374  $POPR3  027406  $RI     027414
                        COS     027536  SIN     027572  ATAN    030112
                        $POLSH  030576  $V20A   030576  SQRT    030602
                        $ERR    030740  $ERRA   030750  $ERVEC  030770
        030776  000472  FTBL    030776
        031470  001462  TABLE   031470  RTSON   031564  DRSON   031565
                        HISTON  031566  BCDON   031567  DRSBUF  031570
                        DRSNPT  031572  USE     031574  RDB     031746
                        ACC     032004  CKCMGN  032030  GETNUM  032042
                        SAVER2  032056  SAVFAC  032062  SAVINT  032066
                        RESTR2  032074  REGSAV  032100  RESTOR  032116
                        INTST   032126  ERNOR   032226  FLOAT   032234
                        ENTERP  032310  BUFRES  032330  GETV    032346
                        GETBUF  032372  ERBUF   032440  GETDAT  032446
                        STODAT  032600  GETADD  032706  POLENT  033014
                        CKCOMA  033042  STORXT  033052  CKRPAR  033056
                        CONBCD  033066
        033152  001244  ADC     033222  RTS     033330  LED     033734
        034416  000716  $ETR    034432  SETC    034570  HIST    035004
                        WAIT    035060
        035334  000542  DIR     035340  DOR     035434  DRS     035522
                        REL     035706
        036076  001462  CLRD    036164  PUTD    036610  DIS     036652
                        FSH     036726  DXY     037004  DISPLY  037252
        037560  002116  SAVE    037560  FIX0    040420  FIXSP   040430
                -       FREE    041516
        041676  010614  BUFTST  042106  CKEOL   042222  INSRTF  042532
                        DISEND  042534  ACTEND  042536  ACTST   042540
                        #01     042636  #02     042640  SUBP    042704
                        ESUB    043146  ADSTK   043260  NSTSK   043310
                        TAGSRH  043312  TAGEND  043334  ERAS    043354
```

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```
                    LPEN    043580  OLDMOD  043662  DSTP    044256
                    STOPA   044262  CONT    044346  CONTA   044352
                    INIT    044376  INITA   044402  NOSC    044612
                    ON      044622  OFF     044722  FIX     044730
                    ABS.F   045536  STAT    045540  RDOT    045630
                    APNT    046016  VECT    046112  SC.USC  046216
                    TRAK    046544  XGRA    047022  YGRA    047040
                    SCAL    047576  SCL.Y   050270  SCL.X   050300
                    APUT    050360  AGET    050564  FIGR    050740
                    FPUT    051230  TEXT    051524  TIME    052106
                    TIMR    052360  BEG     052404  TAG1    052412
                    DSTOP   052506  DCRASH  052510
        052512  003544  USRARE  052512

TRANSFER ADDRESS = 054736
HIGH LIMIT = 056256
```

```
RT-11 LINK     V03-01     LOAD MAP
BASGT .SAV                16-OCT-74

SECTION ADDR    SIZE    ENTRY   ADDR    ENTRY   ADDR    ENTRY   ADDR

. ABS.  000000  000400  NARRAY  000000  LIMIT   000002  PDL     000004
                        PDSIZE  000006  ARRAYS  000010  COLUMN  000034
                        FAC1    000040  FAC2    000042  T1      000056
                        T2      000060  T3      000062  RND1    000064
                        RND2    000066  FILLCO  000110  $STKSZ  000200
                        .EOL    000201  .RPAR   000237  .COMMA  000243
                        .LPAR   000255  GTVECT  000320  START   001102
                        ARGB    010262  ERRARG  010312  BOMB    010320
                        EVAL    011402  TABLE5  011562  TBL5EN  011626
                        ERRPDL  011772  OPRATO  012166  ERRSYN  012544
                        $OPRAT  012720  ERRMIX  013012  STPRO   013162
                        GETVAR  015364  INT     015574  MAKEST  017252
                        MSG     017452  NORM    017532  NUMOUT  017724
                        NUMSGN  017736  SAVCHA  020570  STOVAR  021254
                        VAL     023354  DPC     172000  DSR     172002
                        DISX    172004  DISY    172006  TKS     177560
                        TPB     177566
        000400  024100
        024500  004276  IFPMP   024500  ERRFPU  024502  $SBR    024502
                        $ADR    024506  ALOG    025242  AINT    025616
                        $INTR   025634  $DVR    025734  EXP     026366
                        $IR     026736  $MLR    027022  $POPR5  027374
                        $POPR4  027374  $POPR3  027406  $RI     027414
                        COS     027536  SIN     027572  ATAN    030112
                        $POLSH  030576  $V20A    030576  SQRT    030602
                        $ERR    030740  $ERRA   030750  $ERVEC  030770
        030776  000310  FTBL    030776
        031306  000002  FLOAT   031306  RTSON   031306  TABLE   031306
        031310  002116  SAVE    031310  FIX0    032150  FIXSP   032160
                        FREE    033246
        033426  010614  BUFTST  033636  CKEOL   033752  INSRTF  034262
                        DISEND  034264  ACTEND  034266  ACTST   034270
                        WD1     034366  WD2     034370  SUBP    034434
                        ESUB    034676  ADSTK   035010  NSTSK   035040
                        TAGSRH  035042  TAGEND  035064  ERAS    035104
                        LPEN    035230  OLDMOD  035412  DSTP    036006
                        STOPA   036012  CONT    036076  CONTA   036102
                        INIT    036126  INITA   036132  NOSC    036342
                        ON      036352  OFF     036452  FIX     036460
                        ABS.F   037266  STAT    037270  RDOT    037360
                        APNT    037546  VECT    037642  SC.USC  037746
                        TRAK    040274  XGRA    040552  YGRA    040570
                        SCAL    041326  SCL.Y   042020  SCL.X   042030
                        APUT    042110  AGET    042314  FIGR    042470
                        FPUT    042760  TEXT    043254  TIME    043636
                        TIMR    044110  BEG     044134  TAG1    044142
                        DSTOP   044236  DCRASH  044240
        044242  003544  USRARE  044242

TRANSFER ADDRESS = 046466
HIGH LIMIT = 050006
```

```
RT-11 LINK     V03-01     LOAD MAP
BASLPS.SAV                16-OCT-74

SECTION ADDR    SIZE    ENTRY   ADDR    ENTRY   ADDR    ENTRY   ADDR

. ABS.  000000  000400  LIMIT   000002  PDL     000004  NARRAY  000005
                        PDSIZE  000006  ARRAYS  000010  COLUMN  000034
                        FAC1    000040  FAC2    000042  T1      000056
                        T2      000060  T3      000062  RND1    000064
                        RND2    000066  FILLCO  000110  $STKSZ  000200
                        .EOL    000201  .RPAR   000237  .COMMA  000243
                        .LPAR   000255  LPSIVA  000340  LPSIP   000342
                        CKLIVA  000344  CKLIP   000346  DRSIVA  000350
                        DRSIP   000352  START   001102  ARGB    010262
                        ERRARG  010312  BOMB    010320  EVAL    011402
                        TABLE5  011562  TBL5EN  011626  ERRPDL  011772
                        OPRATO  012166  ERRSYN  012544  $OPRAT  012720
                        ERRMIX  013012  STPRO   013162  GETVAR  015364
                        INT     015574  MAKEST  017252  MSG     017452
                        NORM    017532  NUMOUT  017724  NUMSGN  017736
                        SAVCHA  020570  STOVAR  021254  VAL     023354
                        LPSAD   170400  LPSADB  170402  LPSCKS  170404
                        LPSPB   170406  LPSDR   170410  LPSDRB  170410
                        LPSDIB  170412  LPSDOR  170414  LPDISS  170416
                        LPDISX  170420  LPDISY  170422  LPSDMA  170436
                        TKS     177560  TPB     177566
        000400  024100
        024500  004276  IFPMP   024500  ERRFPU  024502  $SBR    024502
                        $ADR    024506  ALOG    025242  AINT    025616
                        $INTR   025634  $DVR    025734  EXP     026366
                        $IR     026736  $MLR    027022  $POPR5  027374
                        $POPR4  027374  $POPR3  027406  $RI     027414
                        COS     027536  SIN     027572  ATAN    030112
                        $POLSH  030576  $V20A   030576  SQRT    030602
                        $ERR    030740  $ERRA   030750  $ERVEC  030770
        030776  000164  FTBL    030776
        031162  001462  TABLE   031162  RTSON   031256  DRSON   031257
                        HISTON  031260  BCDON   031261  DRSBUF  031262
                        DRSNPT  031264  USE     031266  RDB     031440
                        ACC     031476  CKCMGN  031522  GETNUM  031534
                        SAVER2  031550  SAVFAC  031554  SAVINT  031560
                        RESTR2  031566  REGSAV  031572  RESTOR  031610
                        INTST   031620  ERNOR   031720  FLOAT   031726
                        ENTERP  032002  BUFRES  032022  GETV    032040
                        GETBUF  032064  ERBUF   032132  GETDAT  032140
                        STODAT  032272  GETADD  032400  POLENT  032506
                        CKCOMA  032534  STORXT  032544  CKRPAR  032550
                        CONBCD  032560
        032644  001244  ADC     032714  RTS     033022  LED     033426
        034110  000716  $ETR    034124  $ETC    034262  HIST    034476
                        WAIT    034552
        035026  000542  DIR     035032  DOR     035126  DRS     035214
                        REL     035400
        035570  001462  CLRD    035656  PUTD    036302  DIS     036344
                        FSH     036420  DXY     036476  DISPLY  036744
        037252  003544  USRARE  037252

TRANSFER ADDRESS = 041476
HIGH LIMIT = 043016
```